CETPartnership

Clean Energy Transition Partnership

CETPartnership Joint Call 2022

13 September 2022

The Clean Energy Transition Partnership is a transnational joint programming initiative to boost and accelerate the energy transition, building upon regional and national RDI funding programmes. The initiative is receiving funding from the European Union's research and innovation programme "Horizon Europe" under grant agreement No 101069750.

Contents

1. Introduction and background

What is the Clean Energy Transition Partnership (CETPartnership)?

The Clean Energy Transition Partnership (CETPartnership) is a multilateral and strategic partnership of national and regional research, development and innovation (RDI) programmes in EU/EEA Member States and non-EU/EEA Partner Countries with the aim to substantially support the implementation of the *European Strategic Energy Technology Plan* (SET Plan). It will contribute to higher level European policy goals towards *Stepping up EU 2030* Climate Ambitions and the *New European Research Area* with the ultimate objective to achieve a climate-neutral society by 2050. The CETPartnership will also address the strategies outlined in the latest EC communications e.g. *A Clean Planet for all* and the *European Green Deal*.

CETPartnership builds on existing SET Plan initiatives (ERA-Nets, IWGs, ETIPs, etc.), and aims to create synergies with the *National Energy and Climate Plans* and with the *Recovery and Resilience Facility (RRF).* Moreover, the CETPartnership will contribute to reaching the objectives of saving energy, producing clean energy, diversifying Europe's energy supplies, strengthening Europe's clean energy value chains and making them more sustainable, as outlined in the recently launched *REPowerEU Plan*.

The Strategic Research and Innovation Agenda (SRIA) of the CETPartnership is the keystone for the implementation of the Partnership. The SRIA serves as a guidance and "compass" for the multilateral collaboration in Europe and beyond for the next 10 years. The national and regional RDI programme owners and managers constituting the partnership share a common vision and objectives, which frame the CETPartnership's transformative research, development and innovation programme. The SRIA reflects their coordinated and harmonised view as well as their high expectations as to the impact of the RDI. To deliver highly transformative outcomes, it follows a challenge-driven and transdisciplinary approach.

CETPartnership Mission

CETPartnership aims to empower the energy transition and contribute to the EU's goal of becoming the first climate-neutral continent by 2050. It pools national and regional RDI funding for the broad variety of technologies and system solutions required to make this transition. CETPartnership envisions a transition driven by industry, public institutions, academia and citizens groups that will make Europe the front-runner in clean energy innovation and implementation. The CETPartnership call welcomes funding organisations from outside Europe, which then expands the impact of climate neutrality to the global arena.

CETPartnership Horizontal Objectives

- Fuel Europe's pathway towards the clean energy transition by coordinating, pooling and strengthening regional, national and international RDI funding programmes
- Accelerate clean energy technology development and transition to the widely decarbonized energy systems through demonstration, innovation in technology development, and integration and system change
- Build an innovation ecosystem that fosters capacity building at all governance and actor levels, faster market diffusion, upscaling and replication thus enabling of the clean energy transition

CETPartnership International Co-operation

The CETPartnership encourages international cooperation beyond the EU/EEA. On a global level, the Partnership collaborates with other international initiatives, such as Mission Innovation (MI) through the MI Calls and by actively connecting the thematic work to the MI Missions.

This call is open to participation from across the world. Applicants from third countries (neither EU Member States nor Countries Associated to Horizon Europe) are free to take part in CETPartnership calls.

However, funding that can be applied for in this call is limited to non-EU/EEA applicants eligible for funding from either *Associated Partners to the CETPartnership*[1] or Partners that have concluded a funding commitment with the CETP.[2] All those Partners are listed as Funding Partners in the table in Section 3.2.

CETPartnership Transition Initiatives

The CETPartnership has seven Transition Initiatives (TRIs) focusing on RDI Challenges that address various **technologies** and **system aspects** connected to the clean energy transition, as well as several **cross-cutting dimensions**.

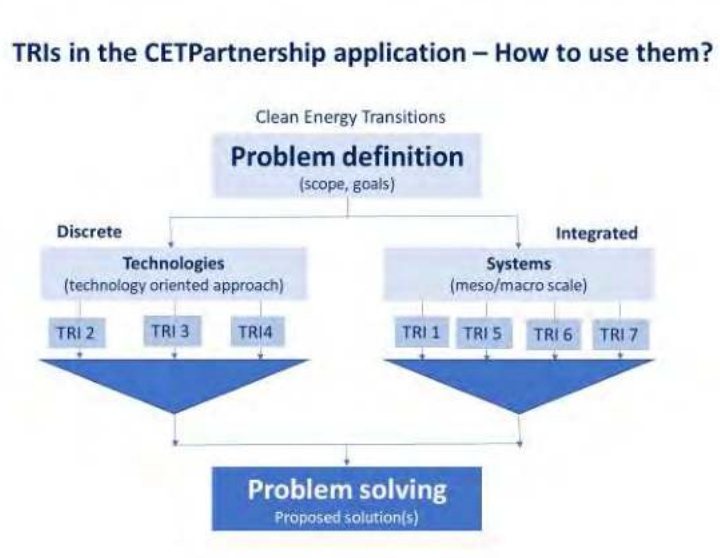

Figure 1: Structure for choosing an appropriate TRI

The TRIs address a broad range of challenges from discrete technologies to integrated systems. There is a focus on technologies for energy conversion and storage as well as for providing carbon treatment and sinks, which are considered as the enabling zero emission technologies for the energy system. Other challenges are connected to storage technologies, technologies that will enable a more flexible demand, and technologies adding to the electrification and a cleaner industry with power-to-x. The enabling technologies themselves need to be explored and improved, including the optimisation of their production processes. They also combine energy system components, which need innovation to be able to provide the right level of service, flexibility, efficiency and robustness.

[1] Associated Partners to the CETPartnership are Funding Partners established in non-EU/EEA countries that are part of the CETPartnership Consortium but are participating at their own costs as they are not eligible for funding under Horizon Europe.

[2] Some call modules include non-Associated Funding Partners that have signed a funding commitment but are not formally part of the CETPartnership Consortium.

CETPartnership TRIs
TRI1: Optimised integrated European net-zero emissions energy system The main objective of TRI 1 is to develop the optimised, integrated European net-zero emissions energy system, where electricity distribution and transmission grids are seen as the "backbone" of the future low-carbon energy systems with a high level of integration among all energy carrier networks, by e.g. coupling electricity networks with gas, heating and cooling networks, supported by energy storage and power conversion processes.
TRI2: Enhanced zero emission power technologies TRI 2's mission is to develop a pool of zero-emission power technologies and solutions based on Renewable Energy Sources as the backbone of the future energy system, being able to deliver carbon-neutral electricity accessible to all and to contribute to the resilience of the system.
TRI3: Enabling climate neutrality with storage technologies, hydrogen and renewable fuels, and CCU/CCS The main aim of TRI3 is to provide technological cleaner solutions for storage technologies, hydrogen and renewable fuels, CCS (Carbon Capture and Storage) and CCU (Carbon Capture and Utilisation). TRI3 intends to fund projects that have a significant bearing on accelerating the technologies and provide results showing significant CO2 reduction by 2030 and demonstrate a contribution to the climate neutrality by 2050.
TRI4: Efficient zero emission Heating and Cooling Solutions The Transition Initiative Heating & Cooling (TRI4H&C) will contribute to Challenge 4 "Efficient zero-emission Heating and Cooling Solutions", formulated in the CETPartnership SRIA. The overarching goals of this initiative are the provision of enhanced and improved heating and cooling technologies and systems for all major parts of Europe by 2030 and to enable 100% climate-neutral heating and cooling by 2050.
TRI5: Integrated regional energy systems The main aim of TRI5 is to develop and validate integrated regional and local energy systems that make it possible to efficiently provide, host and utilize high shares of renewables, up to and beyond 100% in the dynamic local or regional supply by 2030. Such systems shall provide tailor-made solutions that meet the individual regional and local requirements and demand.
TRI6: Integrated industrial energy systems TRI 6 aims at developing and demonstrating a set of technical solutions for integrated industrial energy systems that enables efficient carbon-neutral industrial production sites and takes industrial energy systems into development as part of the entire energy system. It focuses specifically on integrated solutions across industries, across energy sectors and across public and private sectors.
TRI7: Integration in the built environment TRI7 mission is to provide solutions and technologies for existing and new buildings to become an active element in the energy system, with enhanced capability to produce, store and efficiently use energy in the residential and non-residential sector, comprising public and commercial buildings, service and mobility infrastructure buildings, etc.

The TRIs are presented in more detail on the CETPartnership website and a detailed description of the CETPartnership challenges is available in the SRIA.

The Three-layer Research Model – an integrated approach going beyond technology

The CETPartnership supports a paradigm shift towards an integrated and comprehensive approach to innovation. Even if technology will be an important factor, a transition can only happen if there is also

innovation on organisational and societal level. Applicants are therefore encouraged to consider aspects beyond technology. The Three-layer Research Model as described below is meant as a framework that facilitates a structured approach to fostering innovation in project design. The model has a proven track record in Smart Grid development throughout Europe where it has contributed to compatibility, intermobility, scalability, and replicability. The different layers, which are briefly described below in Figure 2, can be used to clearly describe research and innovation activities that integrate technology with cross-cutting dimensions. In general, the layers represent three domains where barriers to transition may be present.

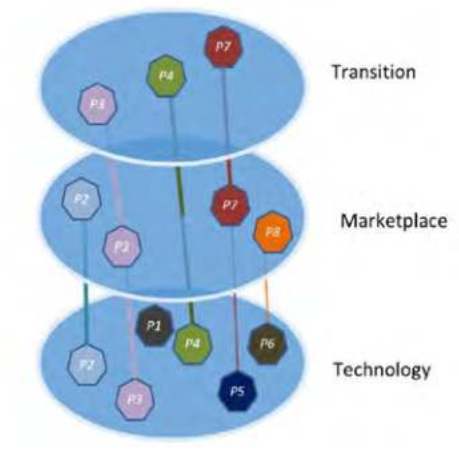

Figure 2: Integrated, interdisciplinary Three Layer Model

1. Technology - enabling; which technology or system solution do we need? (components, hard & software, prototypes, incremental improvement or breakthrough, interoperability, etc.)

2. Market / Goods and Services- structuring; how do we organise it? (living labs, sandboxes, business models, regulatory frame, market design, socio-economic research, etc.)

3. Stakeholder / Transition - overcoming; why do we or don´t we do it? (design, retail, community & society, social sciences, education, policy, governance etc.).

The Three-Layer Research model can be used in all applications for the CETPartnership Joint Call 2022; however, it is a requirement for some of the topics. In proposals related to system integration (see Call modules: TRI 1 RESDemoPowerflex, TRI 5 Integrated Regional Energy Systems) more than one of the three layers must be covered, for all the other Call modules it is optional. To what extent applicants are expected to address the three layers in their proposal is explained in the individual Call modules, which are described below

Please note that the methodologies and approaches, which are used to work on aspects on the different layers included in the project, should be clearly defined. The work plan and deliverables should reflect all included layers and the potential interconnections between them. For projects covering more than one layer, interdisciplinary teams including partners and/or experts with different backgrounds (e.g. economy, market design, management, social sciences, and technology) may be of great value for the project. It is also important that, in case your proposal covers more than one of the layers, the risk assessments for the projects fully consider all layers involved in the project, not only potential technological aspects.

2. CETPartnership Joint Call 2022

The CETPartnership Joint Call 2022 is the first annual co-funded call under the CETPartnership.

2.1 Structure

The CETPartnership Joint Call 2022 is structured by the joint call text and eleven Call modules, provided by the TRIs. The joint call text contains general information about the call, applying to all applicants.

The Call modules describe specific topics and/or challenges that applicants shall address in their project proposal. Applicants must choose and apply to a specific call module when submitting their project

proposal. Evaluation and ranking of the project proposals will be performed separately per Call module.

2.2 CETPartnership Joint Call 2022 Call modules

All CETPartnership Call modules are listed below. The TRI contact persons will be able to answer Call-module specific questions related to the description and requirements of the individual Call modules. Questions of a more general nature should be directed to the Call Management Team (callmanagement@cetpartnership.eu).

Call module	TRI contact person
TRI1: Optimised integrated European net-zero emissions energy system - Call module 1.1: PowerPlanningTools - Call module 1.2: RESDemoPowerFlex	Michele de Nigris Ricerca sul Sistema Energetico (RSE) michele.denigris@rse-web.it
TRI2: Enhanced zero emission power technologies - Call module 2.1 Advancing RE technologies for power production through cost reduction - Call module 2.2 Breakthrough R&D to increase RE power technologies efficiency	Rachele Nocera Ministero dell'Università e della Ricerca (MUR) mariarachele.nocera@mur.gov.it
TRI3: Enabling climate neutrality with storage technologies, hydrogen and renewable fuels and CCU/CCS - Call module 3.1: CCU/CCS technologies - Call module 3.2: Hydrogen and renewable fuels	Ragnhild Rønneberg Research Council of Norway (RCN) rr@forskningsradet.no
TRI4: Efficient zero emission Heating and Cooling Solutions - Call module 4: Heating & Cooling	Gerdi Breembroek Netherlands Enterprise Agency (RVO) gerdi.breembroek@rvo.nl
TRI5: Integrated regional energy systems - Call module 5: Integrated Regional Energy Systems	Fredrik Lundström Swedish Energy Agency (SWEA) fredrik.lundstrom@energimyndigheten.se
TRI6: Integrated industrial energy systems - Call module 6: Industrial energy systems	Fredrik Backman Swedish Energy Agency (SWEA) fredrik.backman@energimyndigheten.se
TRI7: Integration in the built environment - Call module 7.1: R&I in clean energy integration in the built environment - Call module 7.2: Solutions to energy transition in the built environment	Beatriz Gomez Agencia Estatal de Investigación (AEI) beatriz.gomez@aei.gob.es

2.3 Timeline for the CETPartnership Joint Call 2022

CETPartnership Joint Call 2022 timeline	
Joint Call 2022 opens for pre-proposal submission	14 September 2022
Deadline pre-proposal submission	23 November 2022, 14.00 CET
Decision communicated to applicants Joint Call 2022 opens for full proposal submission	20 January 2023

Deadline full proposal submission	20 March 2023, 14.00 CET
Funding decision communicated	June 2023
Project start	September 2023

2.4 Submission of project proposals

All project proposals must be submitted through the CETPartnership Application Portal.

Please note that several Funding Partners may require additional documentation from applicants according to national/regional regulations. Such national/regional applications *cannot* be submitted in the CETPartnership Application Portal but must be submitted directly to the relevant Funding Partner through its national/regional application system. **It is the responsibility of each individual Project Partner to ensure that all the necessary documents are submitted on time to the appropriate recipient.** Please consult the national/regional requirements in Annex B.

No project proposal will be accepted after the submission deadline.

3. Funding arrangements

3.1. Funding of the CETPartnership Joint Call 2022

The total funding of the Joint Call 2022 consists of national/regional budgets and European Commission (EC) contribution, so-called top-up. National/regional Funding Partners will provide funding for entities based in their country/region while the EC contribution will be used to top-up project budgets where national/regional funding has been exhausted.

The Funding Partners participating in the CETPartnership Joint Call 2022 allocate their budget either to the whole call or to the specific Call modules. Funding Partners allocating their budget to the whole call will dedicate their budget to the specific Call modules after the pre-proposal evaluation or after the full proposal evaluation.

Funding of eligible costs must comply with EU/EEA State Aid rules.

3.2. CETPartnership Joint Call 2022 Funding Partners

Country/ region	**Organisation name**	**Acronym**	**Funding available (€) for the Call 2022**
Austria	Austrian Research Promotion Agency	FFG	5 900 000
Belgium (Flanders region)	Fonds Innoveren en Ondernemen	FIO	1 000 000 (tbc)
Belgium (Wallonia region)	Service public de Wallonie	SPW	900 000
Canada (Alberta region)	Emissions Reduction Alberta	ERA	3 470 000
Cyprus	Research and Innovation Foundation	RIF	3 000 000 (tbc)
Czech Republic	Technology Agency of the Czech Republic	TA CR	2 450 000
Denmark	Energy Technology Development and Demonstration Programme	EUDP	1 340 000

Denmark	Innovation Fund Denmark	IFD	1 000 000 (tbc)
Estonia	Ministry of Economic Affairs and Communications	MKM	300 000
Estonia	Estonian Research Council	ETAG	150 000 (tbc)
Finland	Innovaatiorahoituskeskus Business Finland	BF	5 000 000
France	Agence Nationale de la Recherche	ANR	3 000 000
France	Agence de la transition écologique	ADEME	1 500 000
France (Pays de la Loire region)	Pays de la Loire Region Council	RPL	1 000 000 (tbc)
Germany	Forschungszentrum Jülich GmbH (BMWK)	FZJ/PtJ	18 000 000
Germany	Forschungszentrum Jülich GmbH (MWIKE)	FZJ/PtJ	1 428 571
Germany (Saxony region)	Saxon State Ministry for Science, Culture and Tourism	SMWK	3 000 000
Greece	General Secretariat for Research and Innovation	GSRI	500 000
Hungary	National Research, Development and Innovation Office	NKFIH	1 160 000
Iceland	The Icelandic Centre for Research	RANNIS	1 000 000
Ireland	Department of the Environment, Climate & Communications/Geological Survey Ireland	GSI	400 000 (tbc)
Ireland	Sustainable Energy Authority of Ireland	SEAI	500 000 (tbc)
Israel	Ministry of Energy	MoE	600 000 (tbc)
Italy	Ministry of Economic Development	MiSE	16 000 000
Italy	Ministero dell'Università e della Ricerca	MUR	4 200 000
Latvia	Latvian Council of Science	LZP	400 000
Lithuania	Ministry of Energy of the Republic of Lithuania	ENMIN	1 400 000
Malta	Malta Council for Science and Technology	MCST	500 000
The Netherlands	Dutch Research Council	NWO	2 000 000
The Netherlands	Netherlands Enterprise Agency	RVO	8 000 000
Norway	The Research Council of Norway	RCN	12 000 000
Poland	National Centre for Research and Development	NCBR	3 000 000
Portugal	Fundação para a Ciência e a Tecnologia	FCT	500 000 *participation is pending*
Romania	Executive Agency for Higher Education, Research, Development and Innovation Funding	UEFISCDI	1 000 000 (tbc)
Spain	Agencia Estatal de Investigación	AEI	2 000 000
Spain	The Centre for the Development of Industrial Technology	CDTI	1 500 000
Spain (Asturias region)	Fundación para el fomento en Asturias de la Investigacion Cientifica Aplicada y la Tecnologia	FICYT	300 000
Spain (Basque county)	Departemento de Desarrollo Económico, Sostenibilidad y Medio Ambiente. Eusko Jaurlaritza-Gobierno Vasco	EUSKADI	1 000 000
Spain (Basque county)	Ente Vasco de la Energía	EVE	1 000 000 (tbc)
Spain (Cantabria Region)	Regional Development Agency of Cantabria	SODERCAN	150 000
Sweden	Swedish Energy Agency	SWEA	7 000 000
Switzerland	Federal Department of the Environment, Transport, Energy and Communications	DETEC-SFOE	10 000 000
Switzerland	Swiss National Science Foundation	SNSF	550 000

Turkey	The Scientific and Technological Research Council of Turkey	TUBITAK	2 000 000
United Kingdom (Scotland)	Scottish Enterprise	SE	7 105 377 (tbc)
The United States of America	Department of Energy	DOE	5 000 000 (tbc)
		Total sum (€)	143 203 948 €

4. Project proposals

4.1. Eligibility criteria

- Each project proposal must include at least three independent legal entities from at least three different countries participating in the CETPartnership Joint Call 2022, out of which at least two must be EU Member States or Horizon Europe Associated Countries. Applicants not asking for funding are welcome to participate in addition to the minimum consortium requirement.
- The total effort of one partner cannot exceed 60% of the total project efforts (measured in person months).
- The total effort of partners from one country/region cannot exceed 75% of the total project efforts (measured in person months).
- Project consortia must fulfil the Call module specific requirements of what type of partners to involve. Please find any specific requirements within the respective Call module.
- Project proposals must be written in English and submitted to the CETPartnership Application System before the deadline.
- Designated proposal forms must be used.
- Applicants must be eligible for funding according to their Funding Partner's national/regional requirements (see Annex B). For some Funding Partners, only certain types of organisations are eligible according to national/regional regulations. Please consult the national/regional requirements (Annex B). Applicants are encouraged to contact the relevant contact person at the national/regional funding organisation with questions concerning the specific eligibility criteria.

4.2. Project requirements

Project consortia

- Consortia may consist of partners from organisations such as universities, companies, industry organisations, local/regional governments, research organisations and NGOs. Some Call modules specify additional requirements or restrictions regarding the types of partners to be included.
- Project consortia must include one project Coordinator who is responsible for coordination of the project. Other consortia members are Partners, whereof there are two categories:
- Partners eligible for direct funding by the Funding Partners participating in the CETPartnership Joint Call 2022, or fully self-financed Partners from any country/region who bring their own secured budget. The self-financed partner cannot be the project Coordinator and does not count to fulfil the transnationality criteria mentioned in section 4.1.

Project duration

- Projects are required to start before 15 December 2023.

- The maximum project duration must not exceed 36 months.
- National/regional limits regarding the duration of projects may apply.

Technological Readiness Level (TRL)

The CETPartnership aims to fund projects that develop applicative solutions and provide results for the clean energy transition. The required TRL that a proposal should aim for is defined by each specific Call module and partially depending on the funding organisations' national/regional requirements. Overall, most projects are expected to aim for solutions meeting medium to high technology readiness levels (TRL 6-8), combining technologies, market related solutions and stakeholder involvement. This will in some cases include the preparation or implementation of demonstration projects and may also include market uptake measures (up to TRL 9). In selected areas, concepts, and technologies may target a lower TRL level (3-6) on the basis of specific R&I needs as detailed in the related Call Module(s).

Cross-cutting dimensions

In addition to the CETPartnership challenges represented by the seven TRIs, the cross-cutting dimensions are an integral part of the CETPartnership. Cross-cutting dimensions, beyond technology and resources, need to be considered to ensure robust transition pathways that are driven by a multidisciplinary perspective. Dimensions include transition pathways, regulations, circularity, digitalisation as well as policy and social aspects. The three-layer research model described in chapter one offers a framework to approach cross-cutting dimensions and multidisciplinary aspects.

Societal stakeholders and innovation ecosystems play a pivotal role by engaging the transdisciplinary demonstration, innovation and research activities, which are important and require adequate framework conditions. Here are aspects like regulatory frameworks, tariffs, education and training that shall accelerate the fulfilment of climate and energy ambitions in the EU.

- Robust transition pathways for a sustainable integrated European energy system
- Accelerating transition and innovation ecosystems
- Developing policies and actions to ensure a fair, just and democratic transition
- Encouraging transition based on resource efficiency and circularity principles
- Regulation and market design to support optimal resource allocation and value creation both in short term and long term.

A more detailed description of the CETPartnership cross-cutting dimensions is available in the SRIA. Cross-cutting dimensions are integrated and adapted to the separate Call modules and must be addressed in the project proposal.

Gender Equality Plan

For all public bodies, higher education institutions and research organisations from EU Member States and Associated Countries having a Gender Equality Plan (GEP) at organisational level is an eligibility criterion for funding in the CET Partnership calls following the GEP requirements in Horizon Europe. The following requirements apply:

- The GEP must be signed by the top management and be publicly available on the organisation's website
- The GEP must contain commitment of human resources and gender expertise to implement it
- The GEP must provide information on gender balance for staff and management

- The GEP must show how staff and management will receive training/awareness-raising on gender equality.

The GEP requirement does not apply to the business sector, special interest organisations or the non-profit sector.

More information can be found in the Horizon Europe guidance on gender equality plans.

Open access

Open access as required by the European Commission within Horizon Europe will be assessed as part of the project proposal's methodology under the Excellence Award Criterion.

Knowledge Community

Projects funded under the CETPartnership Joint Call 2022 are expected to actively participate in the CETPartnership Knowledge Community and exchange knowledge and lessons learned.

Project proposals must include the Knowledge Community Standard Work Package in their workplan. Please find more details about the Knowledge Community under section 8 and Annex A.

4.3. Conflict of Interest

The following individuals are not eligible for proposal submission: CETPartnership Governing Board members, CETPartnership General Assembly members or researchers from participating Funding Partners[3]. In addition, applicants cannot act as evaluators of any Joint Call 2022 proposals.

5. Call procedure

The call is organised as a 2-step-procedure: submission of a pre-proposal followed by an invite to submit a full-proposal.

5.1. Submission of pre-proposal

In stage 1, a pre-proposal and any supporting documents must be submitted by the project Coordinator through the CETPartnership Application portal. Text and page limits are set within the Application Portal and applicants are advised to include information only directly related to the CETPartnership Joint Call 2022 to preserve focus, structure and clarity in the application. The deadline for submission of pre-proposals is the **23rd of November 2022, 14:00 CET**.

Please note that some Funding Partners may require additional documentation from the project partners according to national/regional regulations. This cannot be submitted through the CETPartnership Application Portal but directly to the relevant Funding Partner according to its internal procedure. **It is the responsibility of each individual project partner to ensure that all the necessary documents are submitted on time to the appropriate recipient**.

5.2. Eligibility check of pre-proposals

The Call Management will perform an eligibility check of the pre-proposals according to the eligibility criteria as described in section 4.1. Pre-proposals failing to fulfil these criteria will not be forwarded for evaluation.

[3] Legal entities who are able to provide written proof that their organizational structure is completely separated from those of the funding agency participating in the CETP call may under these exceptional circumstances submit their proposal for a call under CETP

The Funding Partners will perform an eligibility check based on their national/regional requirements. Please note that Funding Partners will not be able to provide the final eligibility status until receipt of the full proposal.

5.3. Evaluation of pre-proposals

There will be one separate evaluation procedure per Call module. The experts will use the evaluation criteria described in section 6.

In parallel with the national/regional eligibility check, each forwarded pre-proposal will be evaluated by at least three independent experts according to the evaluation criteria described in section 6. The evaluation will result in a ranked list of project proposals per Call module.

5.4. Selection of pre-proposals invited to stage 2

The CETPartnership Funding Partners will agree on the list of pre-proposals to be invited for submission of a full proposal. The decision will be based on the ranked list and the result of the national/regional eligibility check while ensuring that the total budget of invited pre-proposals is balanced in relation to the available budget for each Funding Partner. Proposals scoring below the cut-off as described in Section 6 will not be able to proceed to stage 2.

If projects cannot be invited to stage 2 due to budgetary constraints, the CETPartnership Funding Partners will prioritise projects with higher ranking in each Call module, and if necessary to choose between projects in different Call modules, the following core principles will be taken into account:

- Maximisation of the total output in terms of funded projects,
- Reaching a good balance between the Call modules regarding the output in terms of funded projects,
- Maximisation of the number of countries/regions involved in the funded projects,
- Maximisation of the financial contribution by the EC obtained through the Joint Call 2022,
- Aiming for a similar success rate between the Call modules.

Proposals that have one or more ineligible partner(s) following the eligibility check made by the Funding Partners can still be invited to submit a full proposal if this partner is not the project Coordinator, and if the partner covers less than 25% of the workload (foreseen person month) and provided that the proposal continues to comply with the overall call requirements.

Applicants will be provided with feedback after the evaluation of the pre-proposals, notifying on either rejection or invitation to submit a full proposal.

5.5. Submission of full proposal

In stage 2, a full proposal and any supporting documents must be submitted by the project Coordinator through the CETPartnership Application portal. The deadline for submission of full proposals is the **20th of March 2023, 14:00 CET.**

The full proposal must be consistent with the pre-proposal and may not differ substantially. Minor elements regarding content, project duration, costs, funding, or the roles assigned to the consortium partners, might be slightly altered between phase 1 and phase 2. Such changes must be communicated to the involved project partners and the relevant Funding Partner(s).

Changes in the consortium composition should be avoided, except in cases where an ineligible partner or ineligible partner(s) can be replaced by (a) partner(s) from undersubscribed countries/regions. This possibility is only open for project proposals that are still fulfilling the transnationality criterion without the ineligible partner. Modifications of the consortium are restricted to partners from

countries/regions already part of the pre-proposal consortium, with a potential addition of (a) partner(s) from undersubscribed countries. The project Coordinator cannot be changed. Inclusion of (a) new partner(s) from undersubscribed countries need to be approved by the relevant Funding Agency.

Applicants are again reminded to consider national/regional requirements and make sure that any additional documentation has been sent to the respective Funding Partners. The Funding Partners will perform a final eligibility check based on their national/regional requirements.

5.6. Eligibility check of full proposals

The Call Management will perform an eligibility check of the full proposals according to the eligibility criteria as described in section 4.1. Proposals failing to fulfil these criteria will not be forwarded for evaluation.

The Funding Partners will perform a final eligibility check based on their national/regional requirements.

5.7 Evaluation of full proposals

In parallel with the Funding Partners' eligibility check, each full proposal in a specific call module will, as far as possible, be evaluated by the same three independent experts according to the evaluation criteria described in section 6. Each expert will first individually evaluate the assigned project proposals. Afterwards, an expert panel meeting is arranged where the experts will form a consensus evaluation report. The whole evaluation process will be overseen by an independent observer. The consensus evaluation will result in a ranked list of project proposals per Call module.

Proposals with partners that fail to pass the Funding Partners' final eligibility check will not be forwarded to the expert panel meeting.

5.8 Selection of projects to be funded

The CETPartnership Funding Partners will take funding decisions based on the ranking lists by the expert panel and considering the available budget. The proposed selection list will be developed according to the same core principles as listed under section 5.4 and without leaving any gaps in the ranking lists. Gender balance in personnel named in the proposals will be one of the criteria to decide in case of ex aequo proposals. Proposals scoring below the cut-off as described in Section 6 will not be funded.

Applicants will be provided with a funding decision including the expert consensus evaluation report.

5.9 Decision process

The Call Management will notify the project Coordinator of the outcome of the decision procedure. Both successful and unsuccessful applicants will be provided with the expert joint statement of their project.

6. Evaluation criteria

In both stages the proposals will be evaluated according to the following main evaluation criteria:

- **Excellence**
- **Impact**
- **Quality and efficiency of the implementation**

For proposal evaluation, scores will be awarded for each of the three main criteria. Each criterion will be scored out of 5 (half scores are not allowed) and equally weighted.

The **cut-off** for being invited to second stage/considered for funding at full proposal stage is a score at or above 10 and none of the criteria scoring below 3.

Scores must pass the individual threshold AND the overall threshold if a proposal is to proceed to the second stage. The same rule applies for proposals to be considered for funding at full proposal stage.

The following **sub-criteria** are used in all call modules when determining the scores for excellence, impact and quality of efficiency. Individual call modules may apply additional sub-criteria.

Excellence

- Clarity and pertinence of the project's objectives and the extent to which the proposed work has an appropriate level of ambition for its TRL level, and goes beyond the state-of-the-art.
- Soundness of the proposed methodology, including the underlying concepts, models, assumptions, interdisciplinary approaches, appropriate consideration of the gender dimension in research and innovation content, and the quality of open science practices including sharing and management of research and innovation outputs and engagement of citizens, civil society and end users where appropriate.

Impact

- Scale and significance of the outcomes and impacts and the credibility of the pathways to achieve the expected outcomes and impacts specified in the CETPartnership Call module.
- Suitability and quality of the measures to maximize expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities, including the added value of the transnational collaboration.
- The extent to which the project is showing relevance to the energy transition through appropriate involvement of end-users, need-owners and/or the private sector.

Quality and efficiency of the implementation

- Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages and the resources overall
- Capacity and role of each participant, and extent to which the consortium as a whole brings together the necessary expertise

7. Project implementation

Funding arrangements

Funding arrangements are made directly between the project partners and the national/regional Funding Partner to which they have applied.

Payments and start of projects

It is highly recommended that the project start and end dates are synchronised for all project partners. It is highly recommended that the project participants sign a Consortium Agreement (CA), including IPR related issues, before the start of the project. It is recommended to use the Development of a Simplified Consortium Agreement (DESCA) template for consortium agreements. For project having R&D partners from outside Europe, the DESCA model may not fit, so any type of CA should be considered and accepted by the project consortia.

Payments to project partners are handled by the national/regional Funding Partners. As the national/regional funding arrangements may not become effective simultaneously, the project partners may not receive the instalments at the same time.

Reporting and dissemination

The project coordinator must submit an annual and a final report to CETPartnership. All projects are also expected to setup a webpage and to actively utilise the CETPartnership Knowledge Community described below for increased knowledge-sharing and dissemination of results.

In addition, all project partners must comply with the reporting requirements of the respective national/regional funding organisations as stated in Annex B.

Changes in active projects

Any substantial changes in an ongoing project must be reported to and approved by the involved Funding Partners and the CETPartnership Call Management. Any such changes may affect the project funding.

8. The CETPartnership Knowledge Community

All projects funded under the CETPartnership Joint Call 2022 should participate in the CETPartnership Knowledge Community (see Reporting and Knowledge Community Standard Work Package, Annex A). Cooperation and participation in the below-mentioned activities are mandatory for all projects funded under the CETPartnership Joint Call 2022 and the project proposal must include the mandatory work package that foresees the implementation of these activities (see Annex A). In the design of dissemination and exploitation strategies, projects should consider synergies with, and contributions to the CETPartnership Knowledge Community. The annual project reporting mentioned in chapter 7 is an integral part of the CETPartnership Reporting and Knowledge Community Work Package and resources for this task are included in the work package.

8.1Background

The CETPartnership Team implements advanced and innovative follow-up, monitoring and transfer activities in the framework of a CETPartnership Knowledge Community, organised by the CETPartnership Knowledge Community Management.

The goal of the Knowledge Community is to enable knowledge exchange between all CETPartnership funded projects and with national and international experts to leverage synergies. The Knowledge Community aims to develop and present state-of-the-art knowledge and lead discussions in the field of Clean Energy Transition while being a hub and voice for all information related to national/regional CETPartnership RDI players. To this end, the Knowledge Community will link experts from the funded projects and players from other national, transnational and international CETPartnership activities. It will also provide connections to policy makers, stakeholder organisations, programme owners, SMEs and academia from outside the Knowledge Community offering knowledge and supporting them in making strategic decisions. To involve key stakeholder groups, the Knowledge Community will relate to the CETPartnership impact network partners that can contribute to exploitation with important knowledge and tools.

Based on project monitoring results and feedback exchange, co-creation in the Knowledge Community takes place in the framework of working groups, along the thematic challenges addressed by the Transition Initiatives (TRI) and along the cross-cutting dimensions stemming from the CETPartnership Strategic Innovation and Research Agenda. Cooperation and knowledge are being managed on the comprehensive CETPartnership digital collaboration platform.

The Knowledge Community is an integral part of the CETPartnership. It is therefore important that applicants fully consider this concept and its content when developing the project proposal (e.g. by registering for and accessing the CETPartnership digital collaboration platform).

9. Call modules

CETP

Clean Energy Transition Partnership

TRI 1

Integrated Net-zero-emissions Energy System

Joint Call 2022 Call Module 1.1

PowerPlanningTools

1. Proposal content

1.1 Technical content / scope

Transition Initiative 1 (TRI1) – Integrated net-zero energy systems implements the CETPartnership Strategic Research Innovation Agenda (SRIA) Challenge 1, focusing on developing the "Optimised, integrated European net-zero emission energy system", where the energy networks (i.e. electricity, gas, hydrogen, water, heating and cooling, mobility and their integrated and coordinated functioning etc.) play a significant role.

Each single type of energy network is being characterised by its own physical laws, constraints, dynamics, market rules, regulation, standards and requires very specific knowledge and experience of planning and operation. Their development has traditionally proceeded in "silos mode", without any strong driver towards any integrated approach.

The situation is changing very rapidly: the threats linked with climate change, the increased risks connected to the recent geopolitical situation where the European energy security is endangered, the urgent need to increase very rapidly a massive use of renewable energy sources, thus dramatically accelerating the achievement of the objectives of the "Fit for 55" European energy strategy[4], is driving a quick evolution:

- Planning and operation of each energy system must be considered at the light of increasing uncertainties in boundary conditions (variability of sources, volatility of prices, adaptability of loads, extreme events, cyber threats etc.): stochastic approaches and risk-based analysis must be applied in the lifecycle studies of networks;
- interdependencies among systems are becoming more important. For example, the reliability of the electricity system always becomes mode dependent from the correct functioning of the communication system; cascading effects among different energy networks must be considered with a wider approach also through integrated approaches and models, where the system interdependencies are evidenced according to a global resilience approach;
- system integration is more critical: electric system flexibilities, for example, can be sought in the integration with other vectors, such as thermal systems, mobility, hydrogen etc. Although the physical dynamics of such systems are different, integrated modelling across several energy vectors become always more important. Integrated modelling is a very complex science and may require very advanced computing techniques, such as parallel and quantum computing;
- the development and application of low cost connected equipment has boosted the potential observability of the energy system: millions of devices acquire all sorts of physical quantities potentially of interest for the energy system: meteorological data, air, quality, traffic, power flows in networks, water quality, network loads, ice sleeves over line conductors etc. This huge quantity of data can be transformed into information and knowledge through data analytics to feed Artificial Intelligence, Digital Twins, etc. and to help identifying optimisation and efficiency pathways. Specific research and innovation are also required in this field of activity;
- there is a particular need to further develop and connect bottom-up national modelling exercises to consistent European model results, providing a basis for a future-proof industrial investment strategy, infrastructure investment strategy for utilities, and a robust set of national policies.

[4] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

Important aspects of innovative model development are the inclusion of cross-border energy flows, the selection of consistent transnational, transregional and beyond Europe scenarios.

The overall objective for the TRI1 Call module is to contribute to accompany and drive the energy system transformation through the development, validation, assessment and use of a series of modelling and analysis tools that will enable the adequate level of analysis needed: improved handling of uncertainties; operational models of multi-vector energy systems; improved planning tools; modelling transition pathways to adequately model and simulate the impact of market design and regulation. Research activities need to be undertaken to realize the full potential of system integration, as stated in the CETPartnership SRIA.

This Call module is therefore organised around a methodological research approach for the development and use of tools, methods, and advanced modelling to enable the optimised integrated energy system. It ranges from scenario setting to planning, operation, regulation and market models, end-user engagement.

1.2 Objectives for the Joint Call module

The goal of the TRI1 Call module is to contribute, through financed projects, to bridging knowledge and experience gaps along the priorities evidenced in the CETPartnership SRIA and in the roadmaps and implementation plans of the SET-Plan IWG4, ETIP SNET and Mission Innovation (MI2.0 Green Powered Future Mission)[5] paying attention to add value through the specific approach adopted, thus avoiding duplication.

Projects are expected to contribute to the development, demonstration and/or application of the elements of a toolbox needed to plan and operate future integrated energy systems enhancing inclusiveness, sustainability and resilience. In particular, one or more of the following aspects shall be considered:

- **Resilient planning and operation**: development, validation and use of tools for planning under high uncertainties conditions using stochastic and risk-management approaches and considering external threats (climate change, cyberattacks, etc.) as well as internal threats (equipment failures, market disruptions etc.), evaluating the system vulnerabilities and the related possible contingencies and risks, while identifying the possible mitigation measures;
- **National vs European perspectives**: developing and connecting bottom-up national modelling exercises to consistent European model results, including cross-border energy flows, and selecting consistent transnational, transregional and beyond Europe scenarios;
- **Integrated energy system planning tools:** development, validation and use of tools for addressing holistically an energy system where all vectors interact with one another, making use of new computational technologies such as quantum computing;
- **Market design and regulation:** the rules and incentives that apply to market parties *and* to the operators of energy networks need to be coordinated among system levels (e.g. TSO – DSO) and across energy vectors in order to ensure efficient operation of the integrated system as well as to achieve efficient investment decisions by market parties, prosumers and network operators.

[5] Identifying and experimenting means and methods for increasing system flexibility is at the heart of the R&D needs identified by the ETIP SNET Implementation plan 2022-2025. In particular, High Level Use Case (HLUC) n.4 of the Plan ("Massive integration of RES") and its Priority Project Concepts (PPCs) largely address the issue of flexibility. An entire research area of the SET Plan IP of IWG4 (namely, RA 5: "Flexibility enablers and system flexibility") and an entire pillar of the Mission Innovation Green Powered Future Mission (i.e. Pillar 2 – "System flexibility and market design") deal with this important challenge.

Advancements in the modelling and simulation tools for new market design and regulatory options is needed to be able to assess the impacts of proposed changes in market design and regulation.

Energy-economy models: development, validation and use of tools for addressing the impacts of targeted policies on the rest of economy by coupling bottom-up and top-down modelling paradigms. Moreover, these models would assess the socio-economic impacts of energy transitions in line with the just transition mechanism (JTM) addressed in the European Green Deal. Proposals are encouraged to address a key challenge from a practical side to implement change in the energy system and to deliver clear and useful outputs and solutions that stimulate clean energy transition.

In addition to the dissemination and experience sharing within the CETP Knowledge Community, the projects are invited to participate in the activities and events of the BRIDGE[6] community of projects funded under the Horizon Europe in the field of smart energy system, as well as the Energy Modelling Platform for Europe (EMP-E)[7].

1.3 Expected impact

Successful projects financed under this Call module will enable the availability of proven tools for system planning, operation, performances assessment, resilience and sustainability evaluation of the future energy systems.

The projects are expected to contribute to the following impacts:

- Higher confidence about robustness of energy transition scenarios enabled by the use of transparent and open source tools;
- Possibility to handle stochastic boundary conditions (variability of energy sources, variability of loads, volatility of energy costs, environmental threats etc.) to represent the evolution of the energy systems and their threats in view of a higher level of resilience;
- Better technical understanding of cross sectoral and trans-national energy system planning;
- Assessment and optimisation of technical performances and of the economical and societal benefits linked with the evolution of the integrated energy systems as developed using the exploitable results of the projects.

1.4 Target groups

Core participants in the consortia shall be public research organisations, universities and higher education institutions. Consortia are strongly encouraged to involve need-owner(s)[8] and relevant stakeholders from the national/regional innovation ecosystem in all project phases to maximise market acceptance and uptake within the development of technologies and solutions. In the specific case of this Call module, need-owners can be identified among the following stakeholders: transmission and distributions network operators, system integrators, local/regional authorities, etc.

1.5 Indicative targeted TRL

The type of products considered in this Call module are not technologies. Therefore, the definition of TRL is hardly applicable in the frame of the present Call module. Applicants are therefore invited to indicate the value “0” as aimed TRL in the proposal template. However, the Key Exploitable Results

[6] https://bridge-smart-grid-storage-systems-digital-projects.ec.europa.eu/

[7] http://www.energymodellingplatform.eu/

[8] “Need-owner” refers to the role of an entity (e.g. public agency, local/regional authority, energy grid manager/owner, company, building owner etc.), that seek a solution to a specified need (problem) within its area of operation. The “need-owner” has practical insights into what the actual need is and an interest to be involved in the development of a solution. This ensures the development of an optimal solution and facilitates the “need-owner(s)” acceptance and implementation of the solution. There can be more than one “need-owner” to the same need.

(KERs) of the projects shall consist of tools (e.g. models, software, APIs, etc.) developed in open access platforms and developed according to quality standards, characterised by results traceability and system maintainability.

2. Project requirements

2.1 Additional project requirements

As is the general requirement for the CEPT Joint Call 2022, the frameworks and tools developed in this Call module should primarily be available as open source, especially if the tools address overarching issues that are in the general public interest. However, for specific planning approaches that pursue specific economic follow-up activities, closed source approaches can also be used and further developed. If possible, interoperability with other tools (open source, closed source) should be ensured and expanded.

Projects that contribute to the development of a Digital Twin of the EU electricity grid should ensure coordination and exploitation of synergies with the projects from HORIZON-CL5-2022-D3-01-13 and the upcoming calls in HORIZON-CL5-D3 that support digital twin(s) of the electricity grid. Furthermore, these specific projects should also cooperate with ENTSO-E and EU.DSO Entity to ensure a coordinated approach across Transmission System Operators and Distribution System Operators for investments in the digitalisation of the electricity grids.

The development of complex integrated system planning and modelling tools requires significant effort to overcome the existing state of the art. An average of 1-2M€ budget is expected for these projects, depending on the width of the tools proposed.

CETPartnership

Clean Energy Transition Partnership

TRI 1

Integrated Net-zero-emissions Energy System

Joint Call 2022 Call Module 1.2

RESDemoPowerflex

1. Proposal content

1.1 Technical content / scope

Transition Initiative 1 (TRI1) – Integrated net-zero energy system implements the CETPartnership Strategic Research Innovation Agenda (SRIA) Challenge 1, focusing on developing the "Optimised, integrated European net-zero emission energy system", where the energy networks (i.e. electricity, gas, hydrogen, water, heating and cooling, and their integrated and coordinated functioning etc.) play a significant role. The overall objective for this Call module is therefore to contribute to the practical demonstration of innovative approaches to accelerate the evolution of the European energy system towards a capability to seamlessly integrate very high shares of variable renewable energy sources (centralised and distributed). The achievement of the objectives of the "Fit for 55" European energy strategy[9] needs to be accelerated, also in reaction to the recent geopolitical situation where the European energy security is endangered.

Maintaining reliability and quality of service in presence of the variability of supply intrinsic to the renewable energy sources will require the use of a portfolio of flexibility resources. These resources will range from network expansion and interconnection, to demand side response enabled by digitalisation, to distributed and centralised storage resources, and sector coupling, i.e. the link between the power sector and other energy-consuming sectors (e.g. industry, mobility and buildings etc.). Digital solutions will play a key role in this area. All these solutions utilise demand in a flexible manner to integrate variable renewables or reduce primary energy demand through efficiencies and fuel switching (e.g. gas, heat, hydrogen etc.).

Energy networks will play an increasingly important role as the backbone of an integrated net-zero emissions energy system. The developments foreseen in TRI1 can be instrumental in the frame of the smart integration of the widest variety of variable renewable generation sources (bulk and distributed)[10], at European and regional level[11], as well as of the integration of energy vectors and networks (electricity, gas, heat/cool, water, H_2, mobility etc.)[12], of the many different forms of energy storage (electrochemical, geothermal, compressed air, heat etc.)[13] and unleashing the potential of flexibility from industrial[14] and building[15] loads.

The scope of the TRI1 Call module is linked with other Transition Initiatives, in various ways. Therefore, it is suggested that proposals and projects leverage potential synergies. Without being prescriptive, applicants are invited to highlight all possible synergies with the other TRIs, which increase the overall impact of their proposal at the light of an overall system approach. Projects should verify whether specific developments of selected technologies do not fit better into other Call modules, because this module addresses the technical issues of flexibility in complex energy systems.

[9] See COM/2021/550 final.

[10] The technological developments of renewable energy are addressed in TRI2 (Enhanced zero emission Power Technologies)

[11] As addressed in TRI5 (Integrated Regional Energy Systems)

[12] Heating and cooling solutions are addressed in TRI4 (Efficient zero emission Heating and Cooling Solutions)

[13] Storage technologies and solutions are addressed in TRI3 (Enabling Climate Neutrality with Storage Technologies, Renewable Fuels and CCU/CCS)

[14] Demand flexibility from industry is one of the aspects addressed in TRI6 (Integrated Industrial Energy Systems)

[15] Energy management in buildings is addressed in TRI7 (Integration in the built Environment)

1.2 Objectives for the Joint Call module

The goal of the TRI1 Call module is to contribute, through financed projects, to bridging knowledge and experience gaps along the priorities evidenced in the CETPartnership SRIA and in the roadmaps and implementation plans of the SET-Plan IWG4, ETIP SNET and Mission Innovation (MI2.0 Green Powered Future Mission)[16] paying attention to add value through the specific approach adopted, thus avoiding duplication.

Projects are expected to develop, design, test and demonstrate advanced inclusive, sustainable and resilient technologies, systems, control mechanisms and solutions that make it possible to efficiently provide, host and utilise high shares of renewables, up to and beyond 100% in the European system at distribution and transmission level by 2030, handling network constraints and providing flexibility services, ensuring coordination throughout energy sectors.[17]

The proposals are encouraged to be designed in a way that replication, upscaling and market uptake potential is key from the very beginning. To this aim, the proposals shall describe in the chapter "Impact" of their proposal their exploitation strategy, indicating also the need-owner represented in the consortium who can fulfil the outlined exploitation strategy

Solutions developed should be targeted to one or more of the following outcomes:

- Increase **RES hosting capacity** of distribution systems, through **advanced network solutions**, development and standardization of **new components and devices** (to ensure full interoperability), based on power electronics, improved **grid controllability and digitalisation** and improved **forecasting tools** (e.g. digital twin).
- Increase **generators capability to meet network balancing** needs, through faster switch in/out and ramping up/down of all types of generators, including variable RES (e.g. wind, PV, wave), leveraging hydropower (including pumped hydro), cogeneration (CHP), biofuels, geothermal etc.
- Enable the **exploitation of energy storage** through the adequate coordination with system operators to enhance flexibility: demonstrate the **role of large-scale and distributed energy storage** (electricity, thermal, synthetic liquids, hydrogen, etc.) in supporting cost effective decarbonization.
- Develop and test solutions to unlock the **flexibility potential** (demand response and storage) of **industrial processes** and industrial/commercial/residential **building**; platforms to accelerate the adoption of new energy services and technologies.
- Quantify and optimize the impact (opportunities and constraints) of **EV interaction with the grid** (smart control of different charging (slow and fast) infrastructures in providing various flexibility services to local district and national infrastructure: smart Charging and Vehicle-to-Grid).
- Demonstrate the ability of providing management of flexibility by **cross-energy vector coupling** including various P2X, X2P, through innovative control and operation tools for multi-energy systems.

[16] Identifying and experimenting means and methods for increasing system flexibility is at the heart of the R&D needs identified by the ETIP SNET Implementation plan 2022-2025. In particular, High Level Use Case (HLUC) n.4 of the Plan ("Massive integration of RES") and its Priority Project Concepts (PPCs) largely address the issue of flexibility. An entire research area of the SET Plan IP of IWG4 (namely, RA 5: "Flexibility enablers and system flexibility") and an entire pillar of the Mission Innovation Green Powered Future Mission (i.e. Pillar 2 – "System flexibility and market design") deal with this important challenge.

[17] The objective of the call contributes to the needs of knowledge and experience evidenced in the ETIP SNET HLUC n.4 (Massive Penetration of RES into the transmission and distribution grids) and its related PPCs.

The project will be encouraged to collaborate closely with Green Powered Future Mission (Mission Innovation), in particular with the Pillar 2 (Flexibility) and the FP1: 5 Demos in five continents: launching of large Demos with up to 80% Variable Renewable Energy by 2024. An exchange of information or direct participation in these regions is encouraged.
This collaboration will be initially in the form of exchange of information – i.e. participation of CETP projects in Mission Innovation dissemination and discussion initiatives, invitation to Mission Innovation projects in the dissemination events, mutual invitation to surveys, knowledge exchange initiatives, webinars etc.

In addition to the dissemination and experience sharing within the CETP Knowledge Community, the projects are invited to participate in the activities and events of the BRIDGE[18] community of projects funded under the Horizon Europe in the field of smart energy system.

1.3 Expected impact

Successful projects financed under this Call module, are expected to contribute to at least three of the following impacts:

- Unleash the knowledge and experience about the availability, effectiveness, use and performances of different types of flexibility for the resilient operation of RES-based energy systems along the entire value chain (generation, end-use, storage, energy system intrinsic capabilities, synergies with transport);
- Accelerate the development and implementation of market-based sustainable flexibility services for the grid, through the adequate remuneration in multiple balancing/flexibility markets;
- Proven capabilities of flexibility achievable from the generation side to enhance the integration of variable renewables in the electricity system, but also for heating and cooling and carbon-neutral gas systems;
- Increased level of flexibility in transmission and distribution grid management to allow increased integration of RES while maintaining the security of supply at the pan-European level and reducing the need of grid reinforcement;
- Best practices for the optimal use of different storage systems, such as a large storage plants, or aggregation of distributed storage devices (industrial and residential) and demand-side response, or hybrid storage systems able to provide a staking of multiple services and/or advanced specific services (e.g. Virtual Inertia for fast frequency response);
- Standardized flexibility products and services with an adequate level of interoperability;
- Support the development of a Digital Twin of the EU electricity grid, and the digitalisation of the energy sector, as a cross-cutting instrumental tool to achieve the intended outcomes listed in Section 1.3;
- Strengthened collaboration with MI countries.

1.4 Target groups

The consortia shall be adequately balanced, including two or more of the following target groups, depending on the size of the project: public research organisations, universities and higher education

[18] https://bridge-smart-grid-storage-systems-digital-projects.ec.europa.eu/

institutions and "need-owner(s)"[19] and relevant stakeholders from the national/regional innovation ecosystem to maximise market acceptance and uptake within the development of technologies and solutions. In the specific case of this Call module, need-owners can be identified among the following stakeholders: energy supply companies (renewables and conventional), transmission and distributions network operators, system integrators, ICT companies, local/regional authorities, equipment and solutions providers, industrial companies, etc.

Projects are required to have a relevant need-owner represented in the consortium who can fulfil the project's exploitation plan (see also Section 2.2 below).

Depending on the funding available per country, the overall size of each project is expected to range from 1.5-2.5M€.

1.5 Indicative targeted TRL

Projects should target at solutions within Technology Readiness Level (TRL) 5 – 7. Activities with lower TRL levels (3-6) may be included if they contribute to the higher project goal.

Projects may expand on results from and connect to ongoing or recently finished demonstration projects (utilise test infrastructure, utilise knowledge, cooperation of key demos, transfer of results, establishment of new business activity, etc.). They must show complementary and added value, avoiding duplication. Projects should develop new solutions with the potential to become best practice by 2030.

2. Project requirements

2.1 Additional project requirements

The projects shall clearly outline an exploitation strategy in their proposals, so that after the end of the project, the results can be successfully accepted on the market. Projects should therefore have a relevant need-owner represented in the consortium who can fulfil the outlined exploitation plan.

Projects that contribute to the development of a Digital Twin of the EU electricity grid should ensure coordination and exploitation of synergies with the upcoming calls in HORIZONEU-CL5-D3 that support digital twin(s) of the electricity grid. Furthermore, these specific projects and proposals should also cooperate with ENTSO-E and EU.DSO Entity to ensure a coordinated approach across Transmission System Operators and Distribution System Operators for investments in the digitalisation of the electricity grids.

19 "Need-owner" refers to the role of an entity (e.g. public agency, local/regional authority, energy grid manager/owner, company, building owner etc.), that seek a solution to a specified need (problem) within its area of operation. The "need-owner" has practical insights into what the actual need is and an interest to be involved in the development of a solution. This ensures the development of an optimal solution and facilitates the "need-owner(s)" acceptance and implementation of the solution. There can be more than one "need-owner" to the same need.

CETP

Clean Energy Transition Partnership

TRI 2

Zero-emission power technologies

Joint Call 2022 Call Module 2.1

Advancing RE technologies for power production through cost reduction

1. Proposal content

1.1 Technical content / scope

Policy context and challenges

Zero-emission power technologies are a cornerstone of the global and European sustainable energy system of the future. Solar (photovoltaic-PV, thermal and Concentrating Solar Power-STE/CSP), onshore and offshore wind, ocean and other offshore renewables, as well as other renewable energy sources (RES) such as bioenergy and geothermal, are key technologies to make clean energy available, at affordable cost, and in an environmentally and societally sustainable way. To enable a secure, affordable and sustainable energy supply, and the electrification of finale uses that is at the core of the EU energy transition, the integration of RES into the energy system, further reduction of cost, enhanced flexibility and diversification are needed. In addition, a massive renewable energy (RE) technologies rollout shall be accompanied by a sustainable integration into our living and natural environment, and circularity in all parts of the European value chains, in line with the **EU Green Deal**[20] and the recent **RePower EU Plan**[21].

As the actual strains on the energy prices are stressing, a successful transition towards carbon-neutrality able to ensure the secure and affordable energy supply that Europe needs, demands an impressive development and deployment of renewable energy technologies, in order to sustain an accelerated electrification of the final use of energy. Over the last years, there has been a significant increase in efficiency and reduction of costs related to renewable energy. So far, mature technologies such as onshore and offshore wind and photovoltaics (PV) are already contributing with significant shares to the EU energy mix, in particular in the power sector (both considered they generated a fifth of Europe's electricity in 2020[22]). In 2020 RES has overtaken fossil fuels as the number one power source in the EU for the first time, generating 38% of electricity, compared to 37% for fossil fuels (*State of the Energy Union Report 2021*[23]).

According to the EC Report 2021 *Progress on competitiveness of clean energy technologies*[24], wind power installed capacity in the EU accounts to 178.7 GW with offshore alone surging in ten years from 1.6 GW to 14.6 GW installed capacity, and expected to reach 300 GW at 2050 in recent EU scenarios. Solar energy is the most competitive option for electricity generation in a growing number of markets and applications: solar photovoltaics has emerged as a large industry, with a 0.4 TW of PV capacity projected to be installed by 2030 in the EU, and estimated to reach almost 1 TW by 2050. Ocean and marine energy, on the contrary, have a promising but still untapped potential, with tidal and wave energy technologies as the most advanced among the ocean energy technologies, with significant potential located in a number of Member States and Regions. Bioenergy (biofuels in particular) and geothermal energy plays a role as well in the energy transition, particularly in some application areas such as transport or heating and cooling, besides their contribution to electricity generation[25].

[20] COM(2019) 640 final https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN

[21] COM (2022) 230 final https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52022DC0230&from=EN

22 Europe's Power Sector in 2020, published by Ember and Agora Energiewende on 25th January 2021

[23] COM(2021) 950 final https://ec.europa.eu/energy/sites/default/files/state_of_the_energy_union_report_2021.pdf

[24] COM(2021) 952 final https://energy.ec.europa.eu/system/files/2021-10/progress_on_the_competitiveness_of_clean_energy_technologies.pdf

[25] Bioenergy and geothermal are not in the scope of JC2022. RE technologies based on geothermal and bioenergy will be prioritized in JC2023.

Despite these encouraging trends, technological advancement in the clean energy system is of critical importance to stay on track to achieve the EU's climate and energy objective by 2050 and ensure the EU a global leadership on renewables. The recent energy crises due to the Russian conflict and the EU response with the **RePowerEU Plan** asks for a substantial acceleration of the clean energy transition. Ending the EU's reliance on Russian fossil fuels will require a massive scale-up of renewables, faster electrification and replacement of fossil-based heat and fuel in all end use sectors. The clean energy transition will help lower energy prices over time and reduce import dependency, since renewables are the cheapest and cleanest energy available, and can be generated domestically.

Besides being necessary to ensure the security of energy supply and reduce the dependency on imports, the clean energy transition is also an opportunity to support new value chains, consolidating the EU competitiveness and leadership in renewable energy technologies.

In this regard, RepowerEU Plan sets to increase the EU's 2030 target for renewables from the current 40% to 45%, so to bring the total renewable energy generation capacities to 1,236 GW by 2030, in comparison to the 1,067 GW by 2030, envisaged under Fit for 55 for 2030. To accelerate the transition, relevant challenges have to be tackled by means of R&I to boost the deployment of the necessary RES capacity and bring emerging technologies to the commercial stage.

Scope

In this framework, the CETPartnership Transition Initiative 2 (TRI2) is set to support the development of competitive zero-emission power technologies for electricity production basing on Renewable Energy Sources (RES), and to contribute to the implementation of the EU Green Deal.

In the context of the CETPartnership Joint Call 2022, TRI2 focuses on the challenges related to the electricity production, as a priority pathway to the reduction of emissions, as stated in the EU Strategy for Smart Sector Integration. TRI2 **Call Module CH.1 Advancing RE technologies for power production through cost reduction** addresses the strategic Challenge of **performance and technology development** (efficiency and cost) of RES. The call module is, in principle, open to all the broad portfolio of RE zero-emission technologies in TRI2's scope, but specific focus is on power production technologies such as **onshore and offshore wind, ocean and other offshore renewables, solar energy (PV and STE-CSP)** [26].

The Call Module **CH.1 Advancing RE technologies for power production through cost reduction** builds on the CETPartnership Strategic Research Innovation Agenda (SRIA)[27], the Input Papers and the SET Plan Implementation Plans for the Actions 1 & 2 'Global Leadership in Renewables'[28], on the track of the previous ERA-Nets. Main objectives are to support the clean energy transition by delivering performant renewable technologies integrated in the energy system and by reducing costs of technologies.

The Call Module **CH.1 Advancing RE technologies for power production through cost reduction** targets demonstration projects advancing the specific technology, aiming at reducing the LCoE and/or CAPEX through technology development of (primarily) components or at system level.

1.2 Objectives for the Joint Call module

The Call Module CH.1 contributes to the following CETPartnership Horizontal Objectives:

[26] Other R&I challenges and/or prioritization of RES such as bioenergy and geothermal will be prioritized in Joint Call 2023.

[27] https://cetpartnership.eu/sites/default/files/documentation/cetp_sria_1.0.pdf

[28] Available for download on SETIS: https://setis.ec.europa.eu/implementing-actions/set-plan-documents_en#implementation-plans

- Accelerate clean energy technology development and transition to widely decarbonized energy systems through demonstration and innovation in technology development and integration and system change,
- Build an innovation ecosystem that fosters capacity building at all governance and actor levels, faster market diffusion, upscaling and replication and enabling of the clean energy transition.

The objective of the Call Module CH.1 is to advance the broad portfolio of renewable energy power technologies that are at the core of the clean energy transition, with a focus on wind, solar, ocean and other offshore renewable, contributing to achieve the EU targets of +45% RE installed capacity, -55% emissions in 2030, minimizing the environmental and social impact.

Projects must be suited to underpin the overall European strategies to put the energy transition into reality in an efficient, sustainable and cost-competitive way, and contribute to strengthen European industrial leadership in renewables.

The Call Module CH1 will address the technological, environmental, social and economic challenges required to accelerate renewable energy technologies development. Projects must address **one or more of the following objectives**:

- Reduce the LCoE by decreasing the cost per unit of power (CAPEX = Euro per kW installed capacity)
- Demonstrate the reliability of a scale up or an increase of the power unit with a positive impact on LCoE *or*
- Increase overall efficiency (at the system level) reducing the LCoE

and need to further address **at least one of these objectives**:

- Demonstrate the reliability of devices in real environmental conditions, also through de-risking strategies (e.g. digital twin approaches, intermediate scale prototypes in relevant conditions)
- Increase flexibility of applications and demonstrate the technology in different locations or in different weather conditions, including extreme weather and therefore increase the market dimension

Projects shall also take into due account the following cross-cutting dimensions (cf. Joint Call text section 4.2):

- Reduce environmental impact and/or use of soil/surface/maritime space and/or demonstrate the possibility to efficiently couple with other renewable energy production;
- Reduce/minimize the use of critical raw materials (CRM) in the whole life cycle and/or increase lifetime;
- Enhance social acceptance.

Projects focusing on cross-cutting dimensions only (e.g. digitalisation, social aspects, public acceptance or environmental impacts) will not be eligible for funding.

1.3 Expected impact

The main expected outcomes of projects funded under Call Module CH.1 are the scale up of innovative RE technologies and the reduction of costs (CAPEX and LCoE) with respect to state of the art; the diversification and increase of applications and an increased sustainability, so to support competitiveness, market uptake and deployment.

More specifically, projects shall contribute to:

- Reduce the cost of RE technologies both in terms of CAPEX and LCoE;
- Scale-up or increase reliability and efficiency through technology development of (primarily) components or at system level;

- De-risk innovative RE technology applications, e.g. through demonstration of applications in extreme conditions or widening application in different weather/geographical conditions;
- Minimize environmental impacts and/or increase social acceptance and sustainability.

1.4 Target groups

Call Module CH.1 targets consortia comprising at least RPOs (Universities, Research and Technology Organizations) and industrial partners. The participation of industry is a requirement. Participation of industry organizations and other relevant up-takers, as well as regional/local governments, NGOs and/or Consumer Associations in Advisory Boards or as Project Partners is an asset.

Consortia may consist of partners across several positions and disciplines in the R&D&I ecosystems (e.g. basic research, applied research, innovation, business etc.), balanced in a way that the research action is able to achieve TRL 6 or above.

1.5 Target R&D areas

Building on the CETPartnership SRIA and related Input Papers, and the SET Plan Implementation Plans for the Actions 1 & 2 'Global Leadership in Renewables', TRI 2 Call Module **CH.1 Advancing RE technologies for power production through cost reduction** targets primarily the following R&D areas. The indications of priority R&D areas recalled hereinafter shall not be considered as prescriptive.

- **Concentrated Solar Power (CSP)**: development of turbomachinery for the specific condition of CSP and use of more efficient medium and conversion technologies for energy storage in CSP; reduce component prices (receiver collectors) and increase high temperature performances for centralised plant;
- **Photovoltaics**: development of efficient modules for PV; decrease cost of high-performance panels, foil modules; increase lifetime and reliability;
- **Wind** (onshore and offshore): Novel wind turbine system design; optimization, scale up and increased lifetime of onshore and offshore wind turbines; technologies and systems for cost efficient repowering of existing wind farms;
- **Ocean Energy:** scale up and validation of ocean energy technologies (wave, tidal, OTEC) in real sea conditions; optimization of components and system;
- **Offshore and inland water renewables** (including floating PV): demonstration of optimized plant design and/or foundation, connection and mooring for all offshore and inland water technologies; increase experience in real sea conditions of offshore renewable technologies, and develop solutions for coupling different RE sources in off shore and inland water basins.

1.6 Indicative targeted TRL

Call Module CH1 supports projects aiming at achieving Technology Readiness Level (TRL) 6 or above for technologies which can provide significant results to the RE power production by 2030. Activities with lower TRL levels may be included if they contribute to the higher TRL goal of the project.

2. Project requirements

2.1 Additional project requirements

The participation of industry is a requirement. Consortia shall include at least one industrial partner (large industry or SME).

The added value to the project resulting from transnational cooperation must be addressed in the proposal.

There is no limit to the total number of partners who may be involved in a single project. However, TRI2 expects proposals for large projects to be submitted by consortia comprising applicants from at least 3 (three) CETPartnership participating countries.

The present Call Module is aiming at supporting large projects The term “large projects” as used in this call text refers to projects with an expected requested grant of indicatively 4 (four) million Euros.

CETP

Clean Energy Transition Partnership

TRI 2

Enhanced zero-emission Power Technologies

Joint Call 2022 Call Module 2.2

Breakthrough R&D to increase RE power technologies efficiency

1. Proposal content

1.1 Technical content / scope

Policy context and challenges

Zero-emission power technologies are a cornerstone of the global and European sustainable energy system of the future. Solar (photovoltaic-PV, thermal and Concentrating Solar Power-STE/CSP), onshore and offshore wind, ocean and other offshore renewables, as well as other renewable energy sources (RES) such as bioenergy and geothermal, are key technologies to make clean energy available, at affordable cost, and in an environmentally and societally sustainable way. To enable a secure, affordable and sustainable energy supply, and the electrification of finale uses that is at the core of the EU energy transition, the integration of RES into the energy system, further reduction of cost, enhanced flexibility and diversification are needed. In addition, a massive renewable energy (RE) technologies rollout shall be accompanied by a sustainable integration into our living and natural environment, and circularity in all parts of the European value chains, in line with the **EU Green Deal**[29] and the recent **RePower EU Plan**[30].

As the actual strains on the energy prices are stressing, a successful transition towards carbon-neutrality able to ensure the secure and affordable energy supply that Europe needs, demands an impressive development and deployment of renewable energy technologies, in order to sustain an accelerated electrification of the final use of energy. Over the last years, there has been a significant increase in efficiency and reduction of costs related to renewable energy. So far, mature technologies such as onshore and offshore wind and photovoltaics (PV) are already contributing with significant shares to the EU energy mix, in particular in the power sector (both considered they generated a fifth of Europe's electricity in 2020[31]). In 2020 RES has overtaken fossil fuels as the number one power source in the EU for the first time, generating 38% of electricity, compared to 37% for fossil fuels (*State of the Energy Union Report 2021*[32]).

According to the EC Report 2021 *Progress on competitiveness of clean energy technologies*[33], wind power installed capacity in the EU accounts to 178.7 GW with offshore alone surging in ten years from 1.6 GW to 14.6 GW installed capacity, and expected to reach 300 GW at 2050 in recent EU scenarios. Solar energy is the most competitive option for electricity generation in a growing number of markets and applications: solar photovoltaics has emerged as a large industry, with a 0.4 TW of PV capacity projected to be installed by 2030 in the EU, and estimated to reach almost 1 TW by 2050. Ocean and marine energy, on the contrary, have a promising but still untapped potential, with tidal and wave energy technologies as the most advanced among the ocean energy technologies, with significant potential located in a number of Member States and Regions. Bioenergy (biofuels in particular) and

[29] COM(2019) 640 final https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN

[30] COM (2022) 230 final https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52022DC0230&from=EN

31 Europe's Power Sector in 2020, published by Ember and Agora Energiewende on 25th January 2021

[32] COM(2021) 950 final https://ec.europa.eu/energy/sites/default/files/state_of_the_energy_union_report_2021.pdf

[33] COM(2021) 952 final https://energy.ec.europa.eu/system/files/2021-10/progress_on_the_competitiveness_of_clean_energy_technologies.pdf

geothermal energy plays a role as well in the energy transition, particularly in some application areas such as transport or heating and cooling, besides their contribution to electricity generation[34].

Despite these encouraging trends, technological advancement in the clean energy system is of critical importance to stay on track to achieve the EU's climate and energy objective by 2050 and ensure the EU a global leadership on renewables. The recent energy crises due to the Russian conflict and the EU response with the **RePowerEU Plan** asks for a substantial acceleration of the clean energy transition. Ending the EU's reliance on Russian fossil fuels will require a massive scale-up of renewables, faster electrification and replacement of fossil-based heat and fuel in all end use sectors. The clean energy transition will help lower energy prices over time and reduce import dependency, since renewables are the cheapest and cleanest energy available, and can be generated domestically.

Besides being necessary to ensure the security of energy supply and reduce the dependency on imports, the clean energy transition is also an opportunity to support new value chains, consolidating the EU competitiveness and leadership in renewable energy technologies.

In this regard, RepowerEU Plan sets to increase the EU's 2030 target for renewables from the current 40% to 45%, so to bring the total renewable energy generation capacities to 1,236 GW by 2030, in comparison to the 1,067 GW by 2030, envisaged under Fit for 55 for 2030.

To accelerate the transition, relevant challenges have to be tackled by means of R&I to boost the deployment of the necessary RES capacity and bring emerging technologies to the commercial stage.

Scope

In the context of the CETPartnership Joint Call 2022, TRI2 focuses on the challenges related to electricity production, as a priority pathway to the reduction of emissions, as stated in the EU Strategy for Smart Sector Integration. TRI2 **Call Module CH.2 Breakthrough R&D to increase RE power technologies efficiency** addresses the strategic Challenges of **performance and technology development** (efficiency and cost) of RES. The call module is, in principle, open to all the broad portfolio of RE zero-emission technologies in TRI2's scope, but specific focus is on power production technologies such as onshore and offshore **wind, ocean and other offshore renewables, solar energy (PV and STE-CSP)** [35].

The Call Module **CH.2 Breakthrough R&D to increase RE power technologies efficiency** builds on the CETPartnership Strategic Research Innovation Agenda (SRIA), the Input Papers and the SET Plan Implementation Plans for the Actions 1 & 2 'Global Leadership in Renewables', on the track of the previous ERA-Nets. Main objectives are to support the clean energy transition by delivering performant renewable technologies integrated in the energy system, reducing costs and increasing efficiency of RE technologies.

1.2 Objectives for the Joint Call module

The objective of the Call Module CH.2 is to **support breakthrough research related to the broad portfolio of renewable energy power technologies** that are at the core of the clean energy transition, with a focus on wind, ocean, marine and solar technologies, contributing to achieve the EU target of -55% emissions by 2030, and minimizing the environmental and social impact.

[34] Bioenergy and geothermal are not in the scope of JC2022. RE technologies based on geothermal and bio- energy will be prioritized in JC2023.

[35] Other R&I challenges and/or prioritization of RES such as bioenergy and geothermal will be prioritized in Joint Call 2023.

Projects must be suited to underpin the overall European strategies to put the energy transition into reality in an efficient, sustainable and cost-competitive way, and contribute to strengthen European industrial leadership in renewables. Research related to crosscutting issues only (e.g. digitalisation, social aspects, public acceptance or environmental impacts) will not be eligible for funding, but projects shall address horizontal aspects, in particular relating to environmental impact, social acceptance and/or circularity and sustainability.

Projects shall address **one or more of the following objectives**:

- Increase the conversion of energy to power and/or technology performance and/or lifetime by use of new materials,
- Develop innovative components ensuring higher efficiency,
- Increase the efficiency and reliability of the energy transfer/conversion technology towards power production,
- Develop modelling approaches and features able to increase system energy efficiency.

Projects shall also address sustainability aspects as cross-cutting dimensions (cf. Joint Call text chapter 4.2):

- Reduce environmental impact (e. g. land use, effects on animal life) or significantly improve multiple use of occupied land surface / or maritime space,
- Minimize the use of critical raw materials (CRM) and apply circularity-by-design approaches.

1.3 Expected impact

CH2 Breakthrough R&D to increase RE power technologies efficiency intends to support R&D projects aiming at increasing the overall efficiency of different RE technologies for power generation, targeting SET Plan objectives.

The main expected outcomes and impacts are:

- the development and validation in relevant environment of breakthrough innovative solutions for increasing the overall efficiency and reliability of renewable power production and the conversion to power of different renewable sources by innovative solutions, at a component or system level, that can strengthen the EU leadership in enhanced renewable technologies;
- minimizing the environmental impact by decreasing the consumption of scarce resources, e.g.: critical raw material or soil/surface use; and contributing to social acceptance;
- accelerating time to market by contributing to overcome the barriers in the first part of the technology death valley thanks to strong transnational collaboration in the framework of the CETPartnership.

1.4 Target groups

Call Module CH2 targets consortia comprising complementary RPOs (Universities, Research and Technology Organizations). Participation of industry, of industry associations and other relevant stakeholders, as well as regional/local governments, NGOs and/or Consumer Associations in Advisory Boards or as Project Partners is an asset.

Consortia may consist of partners across several positions and disciplines in the R&D&I ecosystems (e.g.: basic research, applied research, innovation etc.), balanced in a way that the research action is able to achieve TRL 4 or above.

1.5 Target R&D areas

Building on the CETPartnership SRIA, the Input Papers and the SET Plan Implementation Plans for the Actions 1 & 2 'Global Leadership in Renewables' TRI2 Call Module targets the following R&D areas, TRI2 Call Module **CH.2 Breakthrough R&D to increase RE power technology efficiency** targets primarily the following R&D areas. The indications of the priority R&D areas recalled hereinafter shall not be considered as prescriptive.

- **CSP**: development of components and conversion systems for high efficiency CSP plant
- **PV**: development of cell based on new materials: hybrid tandem, thin film tandem or other breakthrough technologies for use in different applications
- **Ocean Energy:** development of novel ocean energy devices (PTO, components, subsystems); development of other ocean energy technologies (OTEC / Salinity gradient)
- **Wind** (onshore and offshore): Improving the understanding of atmospheric and wind power plant flow physics for designing novel wind turbine systems
- **Offshore renewables**: development of wind or PV floating systems; design of innovative solutions for coupling different RE sources.

1.6 Indicative targeted TRL

The call module aims at supporting projects reaching a Technology Readiness Level (TRL) 4 or above, which can provide significant results to the RE domain by 2030.

2. Project requirements

2.1 Additional project requirements

Projects expected average grant request is indicatively 1,5 million €.

CETP

Clean Energy Transition Partnership

TRI3

Enabling Climate Neutrality with Storage Technologies, Renewable Fuels and CCU/CCS

Joint Call 2022 Call Module 3.1

CCU/CCS technologies

1. Proposal content

1.1 Technical content / scope

The call module on CCU/CCS is based on the previous ERA-Net ACT-initiative [36]with the aim to facilitate the emergence of CO_2 Capture, Utilisation and Storage (CCUS) technologies via funding of transnational projects and knowledge sharing. It aims at facilitating the emergence of CCU and CCS by accelerating and maturing these CCUS technologies through targeted financing of innovation and research activities.

The term CCUS is used to refer to all areas of the CCU and CCS chains. It encompasses a wide spectrum of technologies to capture CO_2 from point sources or directly from the air and either store it porous geological formations that are typically located several kilometres under the earth's surface, on or offshore (CCS), or use it to produce valuable products like fuels for transport, chemicals and other materials (CCU).

The CCU/CCS call module intends to fund projects that have a significant bearing on accelerating the technologies and provide results showing significant CO_2 reduction by 2030 and demonstrate a contribution to the climate and clean transition.

The CCU/CCS call module is seeking innovative projects that range from smaller research projects to new or major expansions/upgrades of existing pilot and demonstration facility sites or projects.

The call module addresses the technological, as well as the environmental, social, and economic challenges required to accelerate CCUS. However, project addressing only the environmental, social, and economic issues are not eligible for funding.

1.2 Objectives for the Joint Call module

Successful projects will facilitate the emergence of CCU/CCS primary in the industrial sectors, but also covers the energy sector. The ambition of the call is to accelerate the time to market for CCU/CSS technologies which will require industrial involvement in research and innovation activities, especially in energy intensive and heavy industry sectors, which will benefit from implementing CCU/CSS technologies mostly.

1.3 Expected impact

Projects funded under this call module are expected to have a significant bearing on accelerating CCU/CSS technologies and provide results showing significant overall CO_2 reduction by 2030.

1.4 Target groups

Consortia may consist of partners from universities, companies, industry organizations, local/regional governments, research organizations and NGOs.

Access to top class research infrastructure is key for reaching the objectives of this call. Project proposals should, if relevant, seek to maximise synergies with existing infrastructures, such as, for

[36] ACT- Accelerating CCS technologies, www.act-ccs.eu

example ECCSEL[37], members of the International Test Centre Network[38], the Hontomin CCS-site[39] in Spain, the Alberta Carbon Conversion Centre (ACCTC[40]) or similar world call infrastructures.

1.5 Target R&D areas

This call module focuses on the technology development within the CCU and CCS domains. Priority will be given to projects that incorporate or address the European Strategic Energy Technology (SET) Plan Implementation IWG9[41]and the Mission Innovation Research Priorities [42](Houston 2017) to guide future CCUS RD&D with special emphasis on the following topics:

Targeted R&D areas include:

- CO_2-capture from energy intensive or heavy industry sectors (waste to energy, cement, steel other metal, others), power, maritime transport, and hydrogen production.
- Advancing lower cost capture technologies and technologies that can effectively handle flue gases with lower CO_2 concentration.
- CO_2-storage sites, elements that are needed for characterisation and management of large-scale permanent storage of CO_2, e.g., reservoir integrity, monitoring, capacity estimation, modelling).
- Enabling CCUS technologies of significant importance and relevance for the industry.
- Transport and injection of CO_2 (pipelines, ships, non-pipeline transport, temporary storage, well integrity and well technology).
- Negative emission technologies (NETs), Carbon Dioxide Removal (CDR) technologies or Direct Air Capture technologies (DAC) with storage or use of CO_2, and Bioenergy with CCS (BECCS),

Please note that CO_2-utilisation projects for producing new products (except for fuels) will be funded under the call module developed by TRI6.

Applications should address at least one of the following.

- Improve the cost- and energy-efficiency along the value chain (scale up, storage in gigaton scale, efficiency, digital tools, effective collaboration among the stakeholders);
- Faster scale up of CO_2-technologies and at lower risk (design, demonstrations, development of legal framework, measures that strengthen the innovation system, knowledge sharing from full scale operations, Integration into the energy-system etc.);
- Develop efficient solutions for capture of CO_2 from clean hydrogen production and new technologies for processing, shipping, transport, and storage of hydrogen;
- Scale up and implementation of new materials that can make CCU/CCS more cost-efficient;
- CCU/CCS market development;
- Minimising negative environmental impact on land and nature for the CCU/CCS value chain, including circular economy;
- Strengthen the society's acceptance for CCU/CCS;
- Increase the knowledge for life-cycle assessment (LCA) and techno-economic analysis (TEA) for CCU/CCS-value chains;

[37] ECCSEL -Carbon dioxide research facilities

[38] International Test Centre network

[39] Hontomin Technology Development Plant (TDP) – CO2 site

[40] Alberta Carbon Conversion Technology Centre

[41] SET Plan Implementation plan for CCU/CCS

[42] Mission Innovation research priorities

- Develop climate negative solutions - direct air carbon capture and storage (DACCS) or bioenergy with carbon capture and storage (BECCS).

1.6 Indicative targeted TRL

The call module aims at supporting projects at Technology Readiness Level (TRL) 5 and above, which can provide significant results to the CCU/CCS domain by 2030. Activities with lower TRL levels may be included if they contribute to the higher TRL goal of the project. However, projects only on lower TRL will not be eligible for funding.

The call module recognises that the acceleration of the deployment of CCUS technologies needs to consider not only TRLs but also costs, markets and supporting frameworks. The Australian Renewable Energy Agency (ARENA) has developed and applied the concept of a Commercial Readiness Index, CRI (Figure 1).

The CRI casts technologies on the one hand in terms of a commercial status (its commercial value proposition and the ability to obtain financing for deployment).

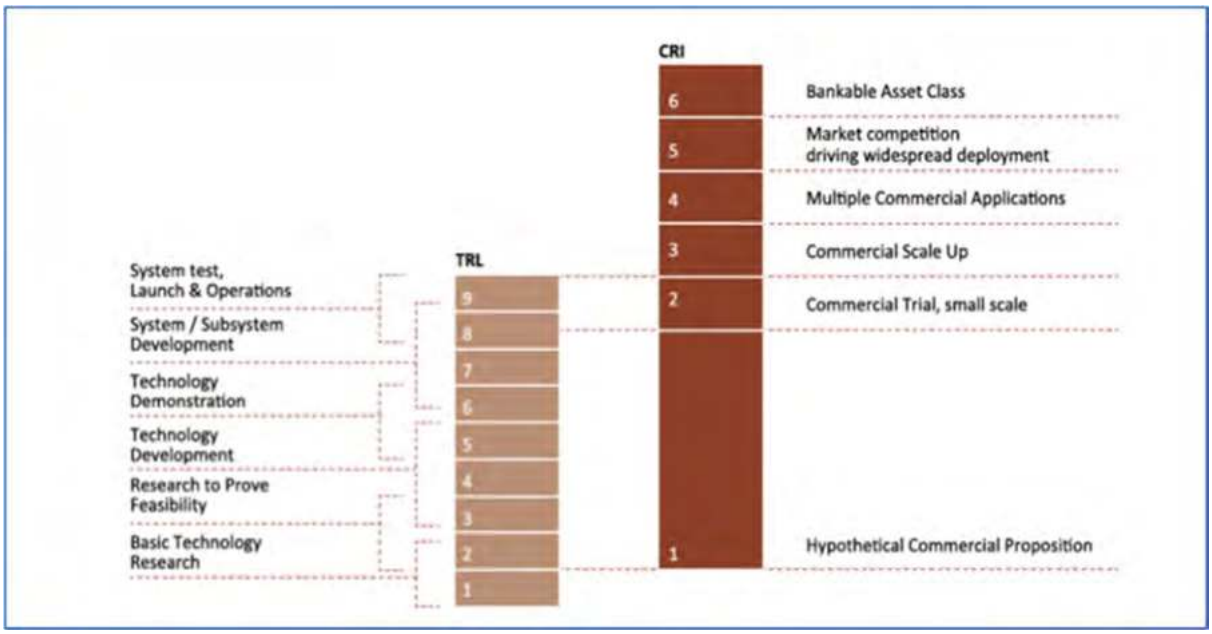

Figure 3:Technology Readiness level (TRL) and the Commercial Readiness Index (CRI)

The framework of CO_2 Storage Readiness Levels (SRLs) (Figure 2) captures the entire picture of technical appraisal, permitting and planning activities for a potential storage site and what must be completed before it can become operational.

The framework is based on the national CO_2 storage portfolios of the UK, Norway and the Netherlands, which represent 742 saline formation and hydrocarbon field sites. However, the methodology can be applied to a potential storage site at whatever stage of appraisal anywhere in the world.

Using this framework, technologies are placed in a setting that considers the regulatory environment, stakeholder acceptance, technical performance, techno-economic assessments and revenue generation potential, state of the supply chain, pathways to market and maturity of the sector where a technology might be deployed. This approach enables the consideration of a complementary set of indicators that are largely governed by location-specific factors that lends itself to transnational research and innovation projects where both, TRL and CRI need advances to accelerate deployment.

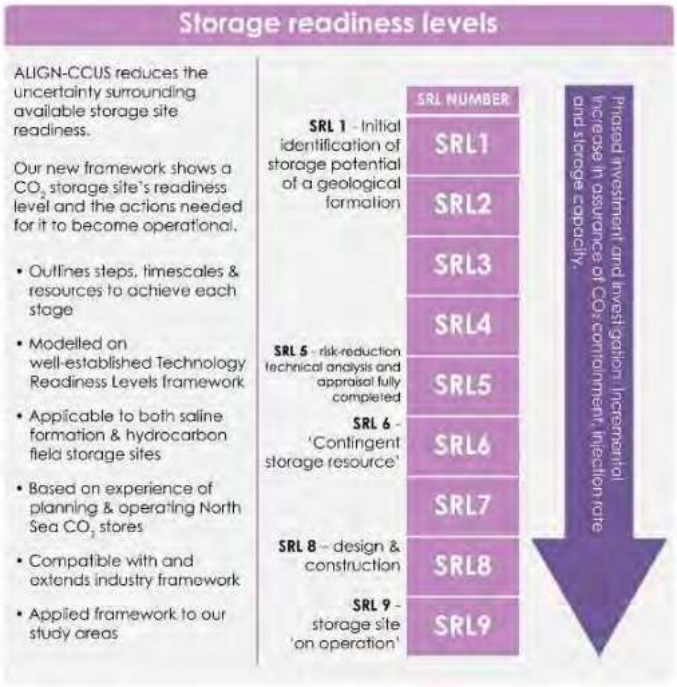

Figure 2: Storage readiness level

Project proposals must illustrate how their projects may help accelerate the time to market of affordable, cost-effective, low environmental impact and resource efficient CCU/CSS technologies. References to CRI, TRL, and SRL can be included when appropriate.

2. Project requirements

2.1 Additional project requirements

Projects being funded should have a significant bearing on accelerating CCUS technologies and provide results showing significant CO_2 reduction by 2030 and demonstrate the value in the climate and green transition.

Where relevant, CO_2 utilisation projects should include documentation to show that the project processes result in reductions of CO_2 emissions. Further information is provided in a number of the relevant funding partners' national/regional requirements.

The consortia are required to demonstrate the interest of industry partner(s) by actively involving them in the project.

Projects focusing on developing new pilot and demonstration facilities are required to illustrate the potential for upscaling to industrial size either in a demo phase or early commercial phase.

Projects must address one or several of the research and innovations activities in the SET-Plan Implementation Plan endorsed by the SET-Plan Steering Group in October 2021 and/or the Priority Research Directions (PRDs) identified at the Mission Innovation CCUS Challenge Workshop (2017) as mentioned in Section 1.5.

In addition to providing technological solutions, projects are required to address cross-cutting dimensions (e.g., digitalisation, social aspects, public acceptance, or environmental impact indicators,

cf. Joint Call text chapter 4.2). However, projects dedicated to cross-cutting dimensions alone are not eligible for funding.

The Call Module aims to support projects with an expected requested grant (but not limited to) in the range of 1 to 5 MEUR.

CETP

Clean Energy Transition Partnership

TRI 3

Enabling Climate Neutrality with Storage Technologies, Renewable Fuels and CCU/CCS

Joint Call 2022 Call Module 3.2

Hydrogen and renewable fuels

1. Proposal content

1.1 Technical content / scope

This call module finances projects on hydrogen[43] and renewable fuels.

The production of **hydrogen** plays a key role in any industrial society, since hydrogen can be used for many essential chemical processes, as fuel to power electric motors via fuel cells, as an input to produce e-fuels[44], biofuels and other hydrogen carriers like ammonia, or to power gas turbines. Further development of hydrogen technologies is necessary to reduce cost and improve process integration and business models.

Hydrogen can be produced from fossil fuels with CCS (so-called blue hydrogen), or from biomass or low-carbon power (so-called green hydrogen). Hydrogen produced by water electrolysis has the advantage of producing extremely pure hydrogen (>99.9%). High purity hydrogen (>99.9%) can also be produced from natural gas, biomass, or other solid feedstocks (e.g. coal, waste plastics and municipal solid waste) through further hydrogen separation or purification.

Integration of hydrogen production and CCS offers significant opportunities for cost reduction. Commercial technologies for this type of hydrogen production are available but not implemented in large scale. **Biomass** can be used to produce different kinds of fuels. Production of hydrogen from biomass through anaerobic digestion, fermentation, gasification, or pyrolysis (all with bioenergy produced with CCS, i.e. BECCS) are at earlier stages of commercialisation. Hydrogen production with BECCS is attractive as it would deliver negative emissions, although it would compete with other sources of demand for biomass.

The international focus on **renewable fuels** is growing steadily to achieve a carbon neutral society. Renewable fuels are environmentally friendly energy carriers and important flexibility options required to achieve a sustainable energy system. Important for a net-zero energy system is the cost-effective provision of thermo-, photo- and electrochemical solar fuels, as well as the supply of advanced biofuels from sustainable biomass. Renewable fuel production, particularly when coupled with power-to-X (e.g. biogas or biosyngas upgrading and solar fuels) and CCUS, offers major opportunities for greenhouse gas mitigation and negative emissions. The provision of such renewable fuels is crucial for industry, as well as for the residential and transport sectors. Low-cost production of such fuels to meet the needs of specific market segments (heavy-duty road transport, shipping, aviation, heat and power generation) requires a clear entry strategy.

The use of **renewable ammonia** (made from sun, air, and water) is expected to increase for both fertiliser and e-fuels. The advantage of renewable ammonia is that its production does not require a CO_2 source, it is easy to transport, and it is an established commodity. Thus, ammonia can be produced at remote locations with access to cheap renewable electricity. Ammonia is not yet approved or tested (e.g. in marine engines), but there are ongoing projects to test the feasibility, also considering hazardous aspects regarding handling of ammonia.

[43] This includes hydrogen produced with maximum emission of 3 kg CO_2eq/kg H_2 (EU taxonomy).

[44] **Electrofuels** or **e-fuels** (synthetic fuels) are an emerging class of drop-in replacement fuels that are made by storing energy from renewable sources in the chemical bonds of liquid or gas fuels, aiming to be a carbon-neutral fuel. They are an alternative to aviation biofuel. The primary targets are butanol, biodiesel, and hydrogen, but include other alcohols and carbon-containing gases such as methane and butane

Electrofuels (e-fuels/synthetic fuels made by storing energy from renewable sources) are expected to impact aviation and shipping in all countries, most likely as sustainable jet-fuel for aviation and as either ammonia or methanol for marine. For short distance ferries, batteries or hydrogen will be an option. The technology for producing e-biofuels requires further development before reaching technical and commercial maturity.

The hydrogen and renewable fuels call module strives to be complementary to calls for proposals issued by the EC under the Horizon Europe Work Programme, or other available instruments, including the national research programmes planned by the countries involved in this collaboration.

The call module addresses the technological as well as the environmental, social and economic challenges required to accelerate the implementation of these renewable or low carbon low-footprint fuels.

The call module seeks to finance innovative projects which can support and provide results to new or already existing pilot and demonstration facilities sites.

1.2 Objectives for the Joint Call module

The objective of the call module is to facilitate the development and adoption of technologies for effective production, usage, transport and storage of hydrogen and renewable fuels, including security aspects.

The ambition of the call module is to accelerate the time to market for hydrogen and renewable fuel technologies. This will require industrial involvement in research and innovation activities.

1.3 Expected impact

Projects are expected to have a significant bearing on accelerating the development and use of hydrogen and renewable fuel technologies and provide results showing significant CO_2 reduction by 2030.

1.4 Target groups

Consortia may consist of partners from universities, companies, industry organisations, local/regional governments, research organisations and NGOs.

Consortia may consist of partners across several positions and disciplines within research and development systems (i.e. basic research, applied research, innovation, business etc.) in a way that the project aims at reaching TRL 5 or above by the end of the project (see also Section 1.6 below). The consortia are required to demonstrate the interest of industry partner(s) by actively involving them in the project.

1.5 Target R&D areas

This call module will focus on the development and demonstration of innovative and cost-, energy- and carbon-/resource-efficient technologies for hydrogen and renewable fuels along the whole value chain:

- Production of hydrogen and renewable fuels including conversion into synthetic fuels. Hydrogen production may differ with respect to available resources and system requirements (i.e. continuity in the production)
- End use (including use of hydrogen in fuel production sites)

- Transport
- Storage.

Projects are required to consider cross-cutting issues[45] such as:

- Consumer attitudes, risk perception and the levers which could influence consumer behaviour;
- Life cycle, techno-economic and environmental impact analyses, including mass, water, land and energy consumptions aspects;
- Barriers, opportunities, and solutions to scaling up;
- System analysis and integration of processes in the energy system, continuity/intermittence;
- Infrastructure and distribution aspects, including pipeline reuse and cost competitive materials for pipelines;
- Digitalisation as part of the project.

1.6 Indicative targeted TRL

The Hydrogen and renewable fuels call module aims at supporting projects at the Technology Readiness Level aiming to reach TRL 5 or above by the end of the project. Activities with lower TRL levels may be included if they contribute to the higher TRL goal of the project

2. Project requirements

2.1 Additional project requirements

The consortia are required to demonstrate the interest of industry partner(s) by actively involving them in the project.

Projects focusing on developing new pilot and demonstration facilities are required to illustrate the potential for upscaling to industrial size either in a demo phase or early commercial phase.

Projects are required to consider cross-cutting dimensions (cf. chapter 4.2 in the Joint Call text) as parts of the project (e.g. digitalisation, social aspects, public acceptance or environmental impact indicators) relevant to the development and uptake of the technologies, and to involve appropriate stakeholders, either are project partners or observers. However, projects focusing only on cross-cutting dimensions are not eligible for funding.

The Call Module aims to support projects with an expected requested grant (but not limited to) in the range of 1 to 5 MEUR.

For hydrogen projects are required to ensure that the results of their projects are disseminated through the existing EU platforms Trust database and/or Fuel Cells and Hydrogen Observatory, when relevant.

[45] See also 4.2 Cross-cutting issues in Common text – Joint Call 2022

CETP

Clean Energy Transition Partnership

TRI 4

Efficient zero emission Heating and Cooling Solutions

Joint Call 2022 Call Module 4

Heating & Cooling

1. Proposal content

1.1 Technical content / scope

The Transition Initiative Heating & Cooling will contribute to challenge 4, "Efficient zero-emission Heating and Cooling Solutions", formulated in the SRIA of the CETPartnership. This initiative's overarching goals are to provide enhanced and improved heating and cooling technologies and systems for all major parts of Europe by 2030 and to enable 100% climate-neutral heating and cooling by 2050. The TRI4H&C will be a significant initiative to foster innovative technical solutions for the heating & cooling transition in Europe.

Projects need to focus on innovations that provide significantly enhanced and improved heating and cooling technologies and systems for all major parts of Europe by 2030, enabling 100% climate-neutral heating and cooling by 2050. Innovations are particularly needed to optimise their efficiency, lower costs, and provide solutions for the heating demand peak in winter and the cooling demand peak in summer. This requires innovations in climate-neutral thermal energy resources, cost-effective solutions to utilise various sources of ambient heat and excess heat, and advances in distribution and conversion technologies. A close interconnection between sources and their temperature level, conversion and distribution technologies, and the end-user requirements is mandatory.

The focus of successful projects should be on thermal energy technologies and related system integration. Besides technological development, projects may include modelling and simulation activities and techniques. Technologies should preferentially be suitable for retrofit, overall contributing to one or more of the following focal areas:

- **Climate-neutral thermal energy resources** for heating and/or cooling, including subsurface (shallow and deep geothermal, solar thermal, and other sources of renewable heating and cooling) and utilisation of local and regional excess resources, for application in the built environment or for industrial or other processes[46] or a combination.
- **A resource-efficient and sustainable distribution, storage and utilisation of heating and/or cooling**. This includes short-time and seasonal thermal storage options, innovations for heating and cooling networks, and conversion technologies such as heat pump to distribute the heating and cooling and adjust the temperature level where needed for application in the built environment and industrial and/or other processes.
- **Integration of heating and/or cooling in the local and regional energy systems**, including aspects of sector coupling, intelligent integration and control tools that shall leverage synergies and utilise flexibilities in locally and regionally available energy sources.

TRI4H&C envisages technology-oriented projects that develop innovations / new solutions that may address cross-cutting topics such as economic modelling, social aspects, environmental concerns, etc. TRI4H&C projects are encouraged to consider cross-cutting topics in their work explicitly. However, applicants must ensure that their proposed work agrees with national funding instruments. Proposals that exclusively consider research on sustainability or social acceptance are incompatible with funding requirements for several participating Funding Partners.

[46] To avoid doubt, any reference to industrial uses should be understood as encompassing other processes that need heating and/or cooling, e.g. horticulture and farming.

The concept of this Call module focuses on technology development but doesn't exclude integration and other cross-cutting issues. Figure 1 illustrates this.

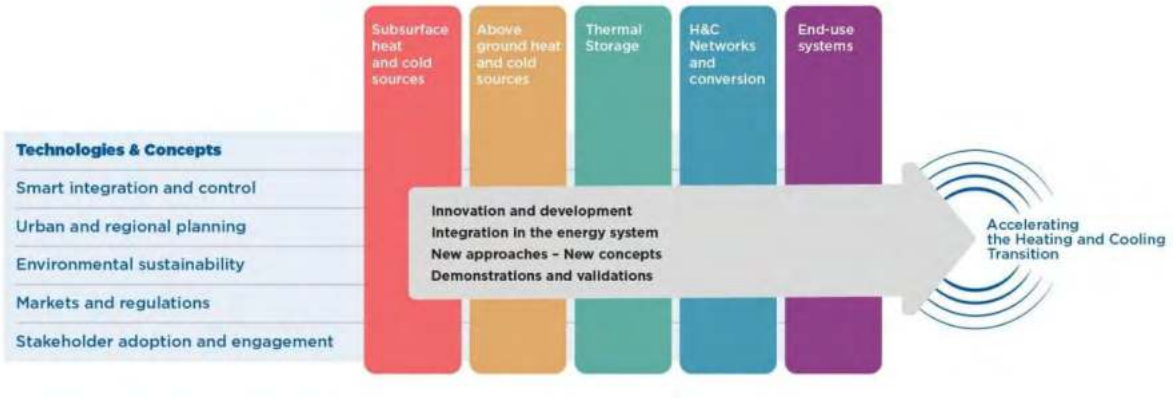

Figure 4 Model of the technical content and scope

Figure 1 schematically shows the scope of the TRI 4H&C Call module. The horizontal bars indicate essential 'areas of interest to adopt innovations in society. The vertical bars indicate the technological scope. The top horizontal bar is bold because it forms the core of this transnational collaboration. The arrow in the figure symbolises the forward and future-oriented approach that builds on these various aspects. Projects can address any topics within the scope of Figure 1. However, the funding organisations and the funding programmes participating in the Call will have limitations regarding eligible issues and/or cost.

The vertical bars show that projects may address various parts of the heating and/or cooling supply chain, which covers all stages in the development chain of secure, sustainable, competitive and affordable heating and/or cooling installations:

- Sub-surface climate-neutral heat and cold sources: geothermal energy from the shallow and deeper subsurface, including exploration, resource development techniques and operation.
- Above-ground heat and cold sources, including but not limited to solar thermal, local and regional excess resources, concentrated solar for (industrial) thermal energy purposes, ambient heat and cold from the air, surface water, sewers etc. In some countries, district heating based on bioenergy and organic waste and excess heat from industry can be applicable.
- Thermal storage includes but is not limited to large-scale seasonal subsurface thermal storage, small-scale hour-to-day thermal storage, smart systems balancing supply and demand, excess power to thermal energy, and thermal storage systems for industrial applications.
- Heating and/or cooling networks, conversion and integration, including but not limited to integration of renewable energies such as geothermal and solar thermal, innovations for more cost-efficient heating and/or cooling networks, retrofit of heating and/or cooling networks, conversion technologies such as heat pumps, and technologies for sector coupling, and smart integration.
- End-use systems: distribution systems within the end-user system (typically a building, a home, or an industrial complex) are a relevant part of the heating and/or cooling system because the temperature level matters.

The projects resulting from this Call are expected to encompass projects related to district heating and/or cooling systems and other collective systems and projects related to individual solutions and heating and cooling innovation targeted toward industrial end-users. The project should address one or more of the abovementioned elements of the heating and/or cooling chain. A significant proportion of the projects is also expected to focus on local and regional sources. Again, this does not preclude projects with different scopes.

The horizontal bars consider relevant 'areas of interest to support innovation in a sustainable society. Projects are encouraged to include these areas in their work plan if relevant:

- Technologies and concepts: developing new technologies and concepts and the related RD&I and bringing these solutions towards a proof of concept and possibly demonstration.
- Smart integration and control: focus on the energy system level. Transforming the global landscape of energy supply and solutions towards a decarbonised, secure and resilient energy system will need holistic system solutions incorporating technologies that can be replicated and scaled.
- Urban and regional planning of energy systems: Innovations to plan future energy system infrastructure and modernise existing energy systems. Including industry actors and all types of excess heat is also encouraged.
- Environmental sustainability is an important boundary condition for future technologies.
- Markets and regulations: Business models, regulatory frame, market design, economic research, etc.
- Stakeholder involvement and engagement: Innovation and transition, user-oriented development, consumer acceptance, education, policy, retail, community/society, social research, etc.

The figure sets out a broad scope, but not all participating funding organisations and programmes will fund activities related to all aspects within the generic scope.

1.2 Objectives for the Joint Call module

Projects need to focus on innovations that provide significantly enhanced and improved heating and cooling technologies and systems for all major parts of Europe by 2030, enabling 100% climate-neutral heating and cooling by 2050.

Starting with the production technologies, the TRI4H&C wants to foster advances in geothermal and solar thermal technologies and renewable cooling technologies while being open to H&C solutions beyond these technological branches. Besides production, the TRI4 sees thermal storage technologies as a key factor for servicing the whole energy system. Together with innovations in distribution and the retrofitting of existing infrastructure, collective systems are formed. It is equally important to service the individual needs of the end-users in each situation. Industrial heating needs to be considered, and solutions for individual buildings or the supply of quarters, cities, and regions. Depending on the geographical location and severe climate change, cooling solutions will rank equally on the agenda.

- For pilots and demos (aiming towards TRL7-9 after project completion), the innovation must enable cost reduction and/or an increase in competitive market opportunities and environmental protection compared to state-of-the-art today. Innovations that significantly impact societal acceptability, safety, and/or circularity are also within scope. Pilots and demos are realised in the operational environment, in 'real life.

- For applied research and development (aiming towards TRL 4-6 after project completion), the project's output must enable significant cost reduction and/or a significant increase in competitive market opportunities and/or tools and methodologies compared to state-of-the-art today. Innovations significantly impacting societal acceptability, knowledge development, experience sharing, safety, and/or circularity are also within scope. Before starting, such projects have a valid proof-of-concept and typically develop the innovation in detail in a laboratory or similar environment.

1.3 Expected impact

Projects funded by this Call should improve business cases and/or increase the competitive market opportunities and environmental protection, compared to state-of-the-art today, through research and innovation. Projects need to aim at advancing towards TRLs 4-9. The projects' results must emphasise market-driven results ready for large-scale implementation in 2030. However, projects may include partly lower TRLs depending on national funding rules.

Project outcomes are expected to help accelerate the time to market secure, sustainable, competitive, and affordable heating and/or cooling solutions. Projects can also focus on bringing upcoming technologies to a level of validation in a relevant environment or on integrating their activities into their already viable and ongoing demonstration or piloting projects.

1.4 Target groups

The TRI4H&C Call module encourages innovative entrepreneurs in small, middle-sized, and large companies, research organisations, and academia to propose. In a small number of partner countries, local and regional governments are also eligible for funding.

Project proposals should include small, medium and large companies and other organisations that will use or develop the technology as partners as possible and sensible. This is also in line with the specific requirements of the national and regional funding agencies. Projects with a demonstration character are encouraged, as well as corresponding strong participation from organisations that demonstrate the innovation (companies and others).

The TRI4H&C encourages consortia with a broad geographic spectrum. Each project consortium must align with the respective Funding Partners' national interests and demonstrate the applicants' competence to undertake the project´s specified themes.

Projects are strongly encouraged to involve "need-owner(s)"[47] and relevant stakeholders from the national/regional innovation ecosystem in all project phases to maximise market acceptance and uptake of the technologies and solutions that the projects develop.

47 "Need-owner" refers to the role of an entity (e.g. public agency, local/regional authority, energy grid manager/owner, company, building owner etc.), that seek a solution to a specified need (problem) within its area of operation. The "need-owner" has practical insights into what the actual need is and an interest to be involved in the development of a solution. This ensures the development of an optimal solution and facilitates the "need-owner(s)" acceptance and implementation of the solution. There can be more than one "need-owner" to the same need

1.5 Indicative targeted TRL

Projects are expected to demonstrate real progress and target to bring the TRL level of their innovation to TRL4-9 after project completion:

Projects need to assess the Technology Readiness Level (TRL) (i) before their work and (ii) indicate by how many levels the technology readiness advances in case of a successful outcome of their project. Projects need to aim at advancing to TRLs 4-9. There will be an emphasis on market-driven projects ready for large-scale implementation in 2030. However, projects may include lower TRLs depending on national funding rules. The TRLs of subprojects/work packages will need to match the national/regional requirements, and the lowest TRL level will not necessarily define the overall TRL of the project.

Project requirements

2.1 Additional project requirements

Call considers that proposals requesting a contribution of between €1.5-4 million[48]each would allow successful projects to address the scope appropriately. Especially projects that include demonstrations might require higher budgets. Nonetheless, this does not preclude submitting and selecting proposals requesting other amounts.

Projects and their national subprojects need to align with the assigned national funding programmes and/or specific national/regional requirements. All proposers should consult the national/regional annexes. For example, in some countries, a project involving the innovative use of excess heat from nuclear power plants would not be acceptable in a funded project.

Projects need to have a project management work package. Projects need to establish their webpage where they publish project updates and results.

Project proposals should include industrial partners, as far as possible and sensible. It is also in line with the specific requirements of the national and regional Funding Partners. Projects with a demonstration character are encouraged, as well as corresponding strong participation from organisations that demonstrate the innovation (companies and others).

[48] Funding rate is different between countries/regions and funding programmes. Therefore, it should be noted that the total project cost can be significantly higher than indicated here.

CETP

Clean Energy Transition Partnership

TRI 5

Integrated regional energy systems

Joint Call 2022 Call Module 5

Integrated regional energy systems

1. Proposal content

1.1 Technical content / scope

The scope of this Call module is the development and validation of integrated regional and local energy systems that are resilient and secure and at the same time efficiently provide, host and utilize high shares of renewables, up to and beyond 100% in the dynamic local or regional supply by 2030. Such systems shall provide replicable model solutions that both can meet the individual regional and local requirements and demand, yet at the same time prove scalability and replicability on a national and transnational level. A crucial corner stone for this call module is that there is a mission driven focus where relevant local and regional stakeholders (need-owners[49]) have a central role in the problem definitions and in the implementation of the project. The anticipated Innovation is required along the following Three Dimensions of Integration:

1. **Smart energy system integration**. New solutions may be in the form of pilots and demonstrations that must optimise RES integration, provide infrastructure that can host generation and demand (in some cases a large number of distributed units), increase flexibility by efficiently integrating different energy carriers as well as utilising (local/regional) storage, network flexibility, supply side coordination and demand side response. They should also provide technology service systems that support highly dynamic business processes having a wide participation and enabling the implementation of complex business models serving different market participants, e.g. individual consumers, prosumers or customer groups and energy communities, as well as system operators, facility managers, energy suppliers, service providers and aggregators.
2. **Cross-sectoral integration**. On a local or regional level, smart energy activities often involve multiple economic sectors. Particularly that means cross-sectoral integration of smart energy systems and energy transition processes with transport (e.g. smart charging including vehicle-to-grid concepts) or industry and trade (e.g. industrial facilities or data centres), or municipal infrastructure (e.g. H&C networks, water supply and sanitation, public transport, buildings, street lighting) or agriculture (e.g. farms). Living labs and testbeds can be instrumental for the evolution of these solutions.
3. **Innovation ecosystems and Integration with local & regional development.** The energy system transformation must be sustainably integrated and adopted to local and regional processes, which means driven by local municipalities, communities, resident industry and stakeholders. Local climate, energy or environmental networks, energy communities, and triple helix organisations are some examples of vital facilitators for developing local ecosystems. Having a focus on regional and local innovation ecosystems leverages the opportunity to promote and deliver decentralised anthropocentric energy approaches [50]to the current energy transition. Innovative solutions will be reshaping the energy system, and those

[49]By "need-owner" the Joint Call 2022 refers to the role of an entity (e.g. public agency, local/regional authority, energy grid manager/owner, company, building owner etc.), that seek a solution to a specified need (problem) within its area of operation. The "need-owner" has practical insights into what the actual need is and an interest to be involved in the development of a solution. This ensures the development of an optimal solution and facilitates the "need-owner(s)" acceptance and implementation of the solution. There can be more than one "need-owner" to the same need.

[50] „Decentralised anthropocentric energy approaches" can be interpreted as utilizing the needs and requirements of local society/stakeholders to steer the direction and development of the energy system.

will require investing in an ecosystem that positions the diversity of people in their different contexts and latitudes having a focus on decentralized energy access and use. The EU Clean Energy package puts people at the centre of this energy transition, and will call for solutions shaping successful outcomes in 2030 and beyond. Moreover, the "Gathering Energy and Digital Innovators from across the EU (GEDI-EU) platform" announced in the upcoming Action Plan on the Digitalisation of the Energy Sector will foster cooperation between many digital and energy actors at national, regional and local level. It is key then to build an adequate framework at a regional level. Besides technological solutions other dimensions must comprise an integral part of the approaches, e.g. regional resources-base (e.g. human, environment, energy, natural resources, etc.) and the existing infrastructures. Last but not the least, there is the need to better understand each local and regional processes, and the required implementation paths of a given innovative energy systems.

In order to reach the goals and desired impacts of integrated regional energy systems in a multi-dynamic environment it is necessary to continue developing and introducing the right enabling technologies, develop and structure the market with new goods and services and to learn more about how to overcome barriers built into communities and society. This indicates the need for: a) integrated approaches, involving cross-sectoral and interdisciplinary proposals; b) Pilot social-technic experiments and/or case studies. The essential innovations to be achieved can be visualised according to the Three-layer research model[51]

1.2 Objectives for the Joint Call module

The objective for this call module is to support development of model solutions with new innovations, knowledge, and competence for integrated local and regional energy systems. This involves demonstrating how stakeholders, regulation and markets enables various technologies on different levels to work together in an integrated system. The development of regional and local energy systems should be orchestrated within a large framework to reach the maximum impact so that all relevant stakeholders of the local communities and regions such as municipalities, clusters, ecosystems and programmes, SMEs, infrastructure providers and operators, crafts, etc., but also the global innovation ecosystems (cluster networks, start-ups networks, etc.) are involved.

In coherence with the CETPartnership Strategic Research and Innovation Agenda (SRIA), this should enable:	
	Integrated regional and local energy systems that enable a secure, resilient and carbon free regional energy supply, at the same time contributing to a **secure and resilient European energy system**, enabling the participation in inter-regional exchange of energy as well as in sharing responsibility to maintain the overall system, considering complying with a sustainable use of local and global resources.
	Leverage synergies and utilize flexibilities in locally and regionally available energy sources and related production characteristics, the local and regional infrastructures as well as the user and consumer structures from different sectors (including e.g.

[51] Add link to three-layer research model in main call text

	communities, industry facilities, or the transportation system) and related consumption patterns;
	Design solutions in a way that **enables citizens, companies, communities and other stakeholders to take part in the related value chains** and the exchange of values on different levels, including the development of appropriate market and business models.

This will imply to enhance the energy infrastructure as a key enabler, develop and adapt energy system components to become interoperable in the energy system as well as to unleash the potential of digital transformation for the regional energy system transition.

1.3 Expected impact

Projects funded under this Call module are expected to contribute both to specific regional and local energy- and climate objectives, at the same time having a larger energy system relevance.

As such project results need to contribute to:	
	Replicable and scalable model solutions as well as tools and guidelines for replicable innovation processes, where innovation is on a system level
	Demonstrating integration or coupling of different energy sectors
	Solutions that stimulate decentralised and distributed ways to create local and regional value
	Further innovation that is happening in an evolutionary and social process
	More active engagement of diversified stakeholders in the local and regional context
	Demonstrating to citizens the importance of regional energy infrastructure as a key enabler for the energy transition

Projects shall clearly present a specific and quantified exploitation strategy to fulfil the expected impact and to create local and regional value.

Proposals aiming at developing innovation ecosystems and integrating regional and local development should look at the potential synergies with and opportunities provided by the "Gathering Energy and Digital Innovators from across the EU" platform.

1.4 Target groups

This Call module targets projects driven by local and regional need-owners (as defined above) that collaborate in close connection with relevant research organisations as well as solution providers from public and private sector.

Target groups include the following entities:	
	Local and regional authorities, stakeholder groups, aggregators
	Private and public need-owners, institutions and citizens, especially involving diversified stakeholders intending to implement innovative and cross-sectoral integrated solutions
	Solution providers (technology product and system developers, service providers etc.)
	R&D institutes, local and regional innovation clusters, programmes and ecosystems, technology transfer agencies, and so forth;
	The innovation supportive culture, which enables both firms and systems to evolve over time.

Projects should reflect in a balanced way the needs of the particular region of interest and cover as many areas of the target groups as possible. Furthermore, the consortium should be able to successfully and independently implement the outlined exploitation plan after the end of the project.

For proposals that intend to work with Demonstration, Real- Lab or Living- Lab approach, it is recommended to consider the JPP SES Living Lab and Test Bed Network[52] when looking for partners.

For proposals that intend to work with data service solutions, it is recommended to consider the JPP SES network of Digital Platform Providers[53] when looking for partners.

1.5 Indicative targeted TRL

Technical research and innovation in projects should target at solutions within Technology Readiness Level (TRL) 5 – 9. Activities with lower TRL levels (3 - 5) may be included if they contribute to the higher project goal. Furthermore, given that projects in this call module are required to be structured around integrated approaches, involving cross-sectoral and interdisciplinary research and innovation, the Readiness Level should be considered along more holistic approaches. In the absence of an equally established and commonly used Readiness concept, this can for instance be described according to the Societal Readiness Level (SRL) developed by Innovation Fund Denmark[54]. The expectation is that projects in this call module target solutions with a Societal Readiness in the interval SRL 5-8. If other Readiness Indicators such as System Readiness Level, Market Readiness Levels or alike are already in use nationally or seem more appropriate they can be referred to as well.

1.6 Indicative Budget

The Call Module aims to support projects with an expected requested grant (but not limited to) in the range of 1 to 5 MEUR.

2. Project requirements

2.1 Additional project requirements

Projects applying in this call module must:	
	Refer the project goals to relevant regional and/or local energy and climate plans (or in their absence to National Energy and Climate Plans) and how the results from the project will contribute to meeting these goals.
	Expand upon clearly described regional and local needs as defined by relevant need-owners, building from a core consortium of local and regional stakeholders in a specific regional context (There are different approaches possible to comply with the requirement to be “transnational”. e.g., one particular regional energy system in a region in focus and partners from other countries contributing to the solutions in this region; or: several regions in different countries collaborating with their need-owners and partners from these regions plus other countries that contribute to the solution; etc.)

[52] https://www.eranet-smartenergysystems.eu/Partners/Living_Labs

[53] https://www.eranet-smartenergysystems.eu/Partners/Digital_Platform_Providers

[54] https://innovationsfonden.dk/sites/default/files/2019-03/societal_readiness_levels_-_srl.pdf

	Show relevance to the Three Layer Research Model "Stakeholder/Adoption, Marketplace, Technology" (min. cover two layers) and the Three Dimensions of Integration "Cross Sectoral, Local and Regional Development, Smart Energy System" (min. two dimensions) as described in section 1.1.
	Projects are expected to consider cross-cutting topics (e.g., digitalisation, social aspects, public acceptance, or environmental impact indicators, cf. Joint Call text chapter 4.2) in their work explicitly.

CETP

Clean Energy Transition Partnership

TRI 6
Integrated industrial energy systems

Joint Call 2022 Call Module 6

Industrial energy systems

1. Proposal content

1.1 Technical content / scope

Transition Initiative 6 (TRI6) - Integrated Industrial Energy Systems implements the CETPartnership's Strategic Research Innovation Agenda (SRIA)[55] Challenge 6. TRI6 will contribute to building a climate-neutral energy system of the future by focusing on how process industries can integrate with the energy system to become carbon neutral.

In the future, electricity will play a significant role as a "primary" energy source for the industries and new innovations are needed to accomplish the transformation of industrial electrification. Further, a large share of the industrial energy supply shall be based on renewable sources. Where carbon emissions cannot be avoided, CO_2 shall be captured, utilized for production of preferably long-lifetime products, or permanently stored. To produce negative emissions, capture, utilization in long-lifetime products and storage of biogenic CO_2 from the exhaust gases, i.e., Bio-CCUS, is an option.

While the energy transition of industries advances, industrial energy systems shall integrate with local, regional, and national heat and power networks and systems. Moreover, the energy and industrial systems shall together integrate as renewable power will also be used to produce hydrogen which can be utilized as an energy carrier or raw materials in industrial processes or with CO2 utilization (CCU) to synthesize e-products for the replacement of fossil-based fuels and chemicals.

The integration of industrial energy systems with local, regional, or trans-regional energy systems supports national and European goals for carbon neutrality. As research, development, and innovation activities (RDI) for industrial carbon-neutrality are already funded at a national level in many countries, a broader experience and knowledge sharing at an international level will be an advantage. Transnational cooperation will boost efficient technology transfer and leverage complementarities for building competitive European value chains.

The Call module for Integrated Industrial Energy Systems module funds research, development and innovation projects that contribute to one or more of the following challenges:

Challenge 1 – Reduction of emissions from the industrial energy system

Funding in this area is directed to projects that contribute to reducing the industry's process-related greenhouse gas emissions and indirect greenhouse gas emissions. The objective is to finance technological leaps and to support industry's ambitions to change to more sustainable production.

Process-related emissions refer to emissions directly from industrial processes according to environmental reporting as well as to emissions that occur during the combustion of residual products from fossil raw materials in production processes, such as flaring of industrial residual gases.

Emissions with an indirect connection to industrial processes are, for example, combustion emissions from on-site power and heat production or diffuse emissions linked to process-related emissions.

Projects that focus on reduction of indirect emissions from industry can only be supported in cases where a reduction in direct emissions from processes is also included in the project or when they

[55] CETP SRIA v1.0-endorsed (eranet-smartenergysystems.eu)

involve a technological leap for the industry. Therefore, projects that only involve conventional fuel changes will not be funded.

Challenge 2 – Removing carbon emissions from the carbon cycle in the industrial energy system

Funding in this area is directed to projects that can contribute to removing industrial greenhouse gas emissions from the carbon cycle through emission separation combined with long-lifetime utilization or long-term storage of carbon. Special emphasis is put on greenhouse gas emissions of biogenic origin and on CO_2 taken out of the atmosphere.

Effective long-term removal of carbon emissions from the carbon cycle can be achieved, for example, by capturing and storing CO_2 from the combustion of biomass and biofuels. Projects related to removing carbon emissions from the carbon cycle do not include CO_2 use (CCU) unless the use is in products with long lifetimes and that can, hence, be interpreted as long-term storage.

Challenge 3 – Integrated energy and resource-efficient industrial energy systems

Funding in this area is directed to projects that increase knowledge and develop new and innovative processes and system integrations that improve sector coupling in an energy and resource-efficient way between industrial energy systems and the energy system in general. System-level integrations across sectoral boundaries will provide support for a more flexible and robust European energy system based on a high degree of variable energy sources.

The projects in this area can include the role of industry in a larger perspective, i.e., integration between different industries or integration between an industrial site and the surrounding local or regional energy system, to create an energy- and resource-efficient system from a holistic perspective. The area thus comprises industrial and cross-sectoral symbiosis, including new industrial and system-integrated structures, i.e., projects that study physical exchanges of energy, material or residual streams in the form of, for example, excess heat or cold, operational and municipal wastes, residual materials and residual flows. This area can thus help to create circular economy solutions for the industry and local communities and regions.

Challenge 4 – Carbon capture for product use in the industrial energy system

Funding in this joint area is directed to projects that address the possibility for industries to implement CCU to produce energy products from their CO_2 emissions. Energy products such as synthetic fuels would serve as energy storages and support balancing of the renewable-based future energy system. These energy products could be produced directly from the CO_2 emission using, e.g., algae, or by synthesis processes with clean hydrogen. Implementation of CCU, hence, can open opportunities for several industries to generate new chemical business in parallel to their traditional industrial production.

1.2 Objectives for the Joint Call module

The Call module for Integrated Industrial Energy Systems **aims at developing and demonstrating a set of technical solutions for integrated industrial energy systems that enables efficient carbon-neutral industrial production sites and takes industrial energy systems into development as part of the entire energy system**. Transition Initiative 6 (TRI6) focuses specifically on integrated solutions across industries, across energy sectors and across public and private sectors.

Special emphasis in this Call module is placed on solutions for system- and process-level integrations for efficient industrial power, heating, and cooling. The industries that are considered include iron & steel, cement, pulp & paper, chemical, and food and beverage industries (non-exclusive list).

The Call module will contribute to an innovation-based growth of the European economy and the European energy transition by supporting projects that lead to faster market uptake, upscaling and increased global competitiveness.

In addition to the dissemination and experience sharing within the CETP Knowledge Community, the projects are invited to participate in the activities and events organised by other partnership programs like Process4Planet[56] or Clean Steel[57].

1.3 Expected impact

The expected impact from projects funded under the Call module for Integrated Industrial Energy Systems is that they contribute to making European industry a part of a climate-neutral economy. Funded projects will strive to:

- increase European industry's competitiveness;
- support the development and pre-commercialisation of future disruptive technologies;
- support a wider use of renewables and alternative energy sources as well as emission control technologies for reducing industrial emissions;
- integrate renewable energy into the industrial energy system to aid increased industrial electrification;
- increase efficiency of industrial energy systems through novel process and system integrations;
- increase circularity through for example CCU or the reuse of waste heat;
- develop sustainable bioenergy and biofuels but also increase the use of industrial Bio-CCUS;
- develop and integrate hydrogen-based technologies into the industrial energy system and related infrastructures.

Funded projects are expected to provide solutions to the Call module challenges through new knowledge, skills, and technologies. The funded projects will also be expected to use need-owners[58], industrial advisory boards and/or a challenge driven approach to improve fit with industrial needs, to foster industrial acceptance and to boost exploitation of research results. Projects shall participate in

[56] About Processes4Planet | SPIRE (aspire2050.eu)

[57] ESTEP - Clean Steel Partnership (CSP)

[58] "Need-owner" refers to the role of an entity (e.g. public agency, local/regional authority, energy grid manager/owner, company, building owner etc.), that seek a solution to a specified need (problem) within its area of operation. The "need-owner" has practical insights into what the actual need is and an interest to be involved in the development of a solution. This ensures the development of an optimal solution and facilitates the "need-owner(s)" acceptance and implementation of the solution. There can be more than one "need-owner" to the same need.

CETPartnership's working groups and workshops to share information, knowledge, ideas, and results to strengthen national and regional research, development and innovation policies.

Projects are expected to advance solution development towards TRL 7 by the end of the project in order to drive clean energy solutions faster towards commercial readiness and contribute to a more sustainable and de-carbonized European energy system based on renewable energy sources.

1.4 Target groups

The call caters to different actors, and it is expected that the following types of actors apply:

- Companies such as industrial companies, suppliers of technology and services
- Research institutes
- Universities and colleges (social science, humanities, technology, economic and science disciplines)
- Municipal companies and other public sector organizations-

1.5 Indicative targeted TRL

This Call module support projects working on Technological Readiness Level (TRL) 3 to 7. However, throughout their execution projects are expected to increase the TRL of the technology or solution towards TRL 7 to move closer to commercial readiness.

2. Project requirement

2.1 Additional project requirements

Projects must involve industrial need-owners in the projects to provide for faster market diffusion, upscaling, and replication of solutions. If universities or research institutes are project leaders, they must have at least one need-owner attached to the project. If the project Coordinator are companies, their customers can be seen as need-owners so there is no need to attach a specific organisation to the project.

The integration of industrial energy systems with local, regional or trans-regional energy systems supports national and European goals for carbon neutrality. As RDI activities for industrial carbon-neutrality are already funded at a national level in many countries, a broader experience and knowledge sharing at an transnational level will be an advantage. Transnational co-operation will boost efficient technology transfer and leverage complementarities for building competitive European value chains.

Cross-cutting dimensions are needed to align transition with industrial and societal goals and thereby in a participatory manner increase the relevance, acceptance and uptake of innovations acting as a system changer. Therefore, it is important that projects relate to cross-cutting dimensions (e.g. transition pathways, regulations, circularity, digitalisation as well as policy, sustainability and social aspects, cf. CETPartnership Joint Call 2022 text Section 4.2). However, research related only to the cross-cutting dimensions will not be eligible for funding.

The Call Module aims to support projects with an expected requested grant (but not limited to) in the range of 1 to 5 MEUR

CETP

Clean Energy Transition Partnership

TRI 7
Integration in the built environment

Joint Call 2022 Call Module 7.1

R&I in clean energy integration in the built environment

1. Proposal content

The **"R&I in clean energy integration in the built environment"** Call module is a Research and Innovation Action (RIA). The Call module content is defined according to the Strategic Research and Innovation Agenda (SRIA), elaborated according to the CET Partnership principles and covers the objectives of **Transition Initiative 7 (TRI7): Integration in the built environment**.

The SRIA proposes a wide picture of improvements in the field. The scope is organised around developments in integration and conversion of renewable energy in the built environment and digitalization in all the building life cycle.

Research and Innovation proposals should include integration at some level in order to prove the role played in the built environment. These actions should prove their contribution to technology improvements through new solutions and capabilities, proof of concepts or optimisations including formalised test and validations.

1.1 Technical content / scope

Proposals should identify the foreseen application(s) of the developments in different building contexts:

- Existing and new buildings
- Residential (urban, rural, isolated) and non-residential buildings (large public and private buildings, commercial malls, service and mobility infrastructures, logistics platforms such us ports airports, railway terminals, roads, large parking areas).
- Old, historical and special buildings.
- Different climate and geographical areas.

Proposed projects should include a perspective for technological transfer including plans for verification and validation, data management and exploitation.

Proposals shall cover solutions for one or several points in the two proposed challenges. The challenges are non-exclusive. Solutions addressing parts of one challenge or parts of both challenges are welcome.

Challenge 1 - Integrate renewable energy conversion technologies for power, heat and cold in buildings. Connect the buildings in networks. Integrate energy storage, zero emission fuel, and activate building parts as energy storage. (Measures contribution to CO2 reduction, and renovation of building rates):	
	PV integration in buildings (including semi-fabricates): module installation, structural, thermal and functional integration, aesthetics solutions, power management, safety, operations and management, maintenance, decommissioning and disposal.
	Integration of solar thermal in buildings and nZEB/Passive-house concepts, combination with other solutions in hybrid products and the use of enablers of sector coupling including improvements at component level.

	Integration/use of biomass and bio-derived energy vectors (e.g. even the generation of biomass within the building skin).
	Integration of new methods for the energy exchange with the electrical grid, including in-building energy generation, storage and active-buildings concept.
	Solutions for optimization and integration/use of local thermal resources like geothermal resources or excess/waste industrial heat in buildings.
	Active facades: solar thermal, BIPV, hybrid PV, PV-thermal, switchable windows, switchable thermal insulation and their system integration.
	Seamless integration of renewable energy technologies in the urban environment, building integrated PV, several types of storage solutions, CHP technologies on fossil-free gaseous fuels (H or synthetic gases, thermochemical solar fuels, electrochemical solar fuels) for historic integration districts or hard-to-retrofit buildings in the energy systems.
	Create climate-neutral buildings or building environment blocks that generate integrated electric and thermal energy systems, with increased use of local renewables, as well as generate local support (citizens and professional stakeholders) to reach sustainability in the long term.
	Include not conventional low temperature sources (data centres).
	Decentralized storage tanks in buildings for thermal flexibility.
	Technologies for non-residential air-conditioning and ventilation
	“Sector coupling“ by means of combined heat and power plants, fuel cell heating and powering, heat pumps, Power-to-X etc.
	Large building (malls, terminals, parking area, building services) energy production and storage systems integration for efficient energy production and uses.
	Grid-service and grid-forming capabilities of buildings for exploring the building flexibility. Integration of energy storage and charging point.
	Integration of electricity and heat storages; integration of mobility concepts.
	Building-to-Building energy and active buildings concepts. Aggregation of energy services and energy traceability.

Challenge 2 - Digitalization for planning, construction phase, commissioning and operation and also decommissioning and disposal. Methods of building performance assessment. (Measure carbon-neutral building stock).	
	Smart decision tools to evaluate the optimal technology choices and sizing in energy generation, storage and management.
	Digitalization of in-building energy management by considering internal energy production and storage as well energy traceability for building-to-building energy flows and active

	buildings by smart contracts (span across energy vectors, increase flexibility and reduce peak loads).
	Flexible energy planning tools and standardized packages for policy making regarding energy choices taking into account local factors, sector coupling, etc**.** Regulatory sand-boxes for testing proof concepts for the next generation energy market.
	Flexible energy planning tools and standardized packages for policy making regarding energy choices taking into account local factors, sector coupling, etc.
	Development of solar cadastres to assess the generation potential of solar energy from the scale of single buildings to energy districts and metropolitan/regional areas. The cadastre might also be linked to a database of suitable technologies to be ranked according to the specifications of the installation site.
	Digitalisation in district heating and cooling networks: large scale collection data located throughout the DHC production, transport, distribution and user chain, machine learning for optimal control of the network and support the analytics intended to maximize use of RES and residual heat to reduce the operational costs.
	Built infrastructure as part of a local/regional decentralised energy system with consumer, prosumer and energy communities.
	Contribution to open platforms for sharing data and models (digital twins) in support of the energy transition for research-based knowledge. Standardization of the solutions.
	Building Information Modelling (BIM) from the cradle to the grave including life cycle analysis. Offer circular-oriented services at different levels of the Construction and Demolition Waste (CDW) supply/value chain. Against the background of rising ecological pressure and threatening scarcity of primary raw materials, demolition has a fundamental role to play in the circular economy (CE) and global decarbonization of the Construction sector, as a source of valuable CDW-originated materials and components that can be effectively recycled or reused into new built structures
	Open source, standardized open interfaces for easy data exchange; big data and open databases.
	Smart tools for Smart Homes + smart buildings with the aim that buildings become active elements in the power supply system (and maybe also in a heat network – if present).

All the proposals shall analyse the cross-cutting dimensions (cf. section 4.2 in the Joint Call text). Identify which are applicable and elaborate the inclusion of those in the proposal.

Cross-cutting dimensions	
	Integrated approach considering technical, societal, economy, architectural, urban planning and transport sector issues.
	Synergies with widespread of energy communities, neutral and positive energy districts and climate neutral cities policies.

	Needs of users have to be taken account for: issues of acceptance, participatory approaches to support the complex transformation processes, new ways of living and working, demography, urban-suburban relationships and sustainable mobility etc. Furthermore, the impact on rent pricing, affordable construction prices, comfort or also user data privacy have to be considered.
	Need of adaptation to meet urban planning regulations and specifically preserve cultural heritage landscape (e.g., building, complex of buildings).
	Increase the smartness of various building systems (energy management and control in broad view, heating, ventilation, electrical, information,…) and evaluate it through objective indexes (Smart Readiness Indicator).
	Indoor Environmental Quality (IEQ)— indoor air quality (temperature, humidity, CO2, Radon,…), lighting, noise, ergonomics—and their effects on occupants or residents comfort must be taken into account. Strategies for addressing IEQ include those that protect human health, improve quality of life, and reduce stress and potential injuries.
	Contribute to co-create and reinforce local regional stakeholder innovation ecosystems.
	Contribute to SRL (System Readiness Level)- TRL assessment framework.
	Contribution to networks of energy transition demonstration site and activities.
	Solutions have to consider different economies of scale and climate context.
	Standardisation of solutions, components and modules taking into account EU regulations.
	Knowledge diffusion (specifically for historical and special buildings where the EU market is crucial).
	Safety and security (cybersecurity, privacy, data protection, data rights) by design intended to generate trust in society and must be included in the proposals.

1.2 Objectives for the Joint Call module

The Call module is intended to establish the first portfolio of new solutions covering a fundamental part of the SRIA regarding RDI for integration in the built environment. Proposals should develop capabilities for integration of energy technologies and digitalization.

The funded projects should become a first group of solutions intended to cover the scope in the SRIA.

The Call module should provide results intended to become building blocks and elements for the building supply chain with capabilities in energy conversion, storage or harvesting. Integration schemas should be part of the solutions. Interfaces of non-homogeneous components and interoperability among them are key points to be considered by design. On the other hand, digitalisation and tools solutions are supporting design, implementation, performance assessment and validation.

A good set of approaches for cross-cutting dimensions inclusion should be obtained from this call. The same applies to IPRs where suitable frameworks should be considered in the projects.

1.3 Expected impact

At scientific and technological level, the portfolio of projects will provide validated solutions ready to be included in new research and innovation processes intended to improvements and/or base for new developments. Valuable infrastructures in this environment should be visible and accessible to the RDI community.

At industrial stakeholders' level, participation of need-owners[1] from the energy, building and installer industry is expected. Their participation should provide requirements in the projects intended to reinforce local industry and drive developments to affordable solutions.

It is expected to yield improved access and higher use of research results, innovation and knowledge. Presented solutions should drive new technologies towards commercial readiness by reinforcing connection with multipliers (architects, civil engineers, craftsmen, engineering offices, and manufacturers), creating high-quality new knowledge and skills in the complete built environment.

Proof methods of building energy performance assessment will support transition to carbon-neutral housing stock.

The prospect of standardized solutions, components and modules will benefit from larger markets and contribute to the efficient use of the funding. The increase of utilisation and sharing of research infrastructures is foreseen to mobilise innovation community.

A wide EU and international market supported by the diffusion of knowledge is the base of efficient responses in the integration of zero emission energy in existing, historical and special buildings as well as in mobility infrastructure.

In addition to the dissemination and experience sharing within the CETPartnership Knowledge Community, the projects are invited to participate in the activities and events organised by other partnership programs like Built4People.

1.4 Target groups

It is expected that project consortia including RDTI community (academia, RDI centres), laboratories and test facilities and industry (energy, installers, building industry, etc.) will submit proposals.

Multipliers, energy, building and installer industry can participate as partners or need-owners at this level. Need-owner can contribute providing requirements and as observers in test and formal validation processes.

1.5 Indicative targeted TRL

Projects applying to this Call module are expected to achieve TRL 3-6. In the same project, different technologies can reach different TRLs.

2. Project requirements

2.1 Additional project requirements

The projects shall include a perspective for technological transfer including:

- Verification and Validation Plan
- Data management plan
- Results management and exploitation plan.

At the pre-proposal stage, a clear mention of the corresponding planning should appear in the 3 sections, a) excellence, supporting project goals, b) impact, as part of the expected outcome and impact and c) Implementation, identifying deliverables in the work plan.

At the proposal stage, an outline of the plans and references to the content should be included. Specifically, the versions/deliverables over the project implementation shall be included in the Implementation section

The Call Module aims to support projects with an expected requested grant (but not limited to) in the range of 0,5 to 5 MEUR

CETP

Clean Energy Transition Partnership

TRI 7
Integration in the built environment

Joint Call 2022 Call Module 7.2

Solutions to energy transition in the built environment

1. Proposal content

The **"Solutions to energy transition in the built environment"** Call module is an Innovation and Demonstration Action (IDA). The Call module content is defined according to the Strategic Research and Innovation Agenda (SRIA), elaborated according to the CET Partnership principles and covers the objectives of **Transition Initiative 7 (TRI7): Integration in the built environment**.

The SRIA proposes a wide picture of improvements in the field. The scope is organized around developments in integration and conversion of renewable energy in the built environment and digitalization in the whole building life cycle.

Innovation and demonstration proposals should include a high level of integration to prove the role played in the built environment.

1.1 Technical content / scope

Proposals shall prove and evaluate the application(s) of the developments in different building contexts:

- Existing and new buildings
- Residential (urban, rural, isolated) and non-residential buildings (large public and private buildings, commercial malls, service and mobility infrastructures, logistics platforms such us ports, airports, railway terminals, roads, large parking areas)
- Old, historical and special buildings
- Different climate and geographical areas

The proposals should prove their contribution to technology improvement (CO2-reduction, reduction of consumed primary energy, etc.) and transfer through system level formal validation or demonstration and costs reduction analyses.

Proposals shall cover solutions for one or several points under the two proposed challenges. The challenges are non-exclusive. Solutions addressing parts of one challenge or parts of both challenges are welcome.

Challenge 1 - Integrate renewable energy conversion technologies for power, heat and cold in buildings. Connect the buildings in networks. Integrate energy storage, zero emission fuel, and activate building parts as energy storage. (Measures contribution to CO2 reduction, and renovation of building rates):	
	PV integration in buildings (including semi-fabricates): module installation, structural, thermal and functional integration, aesthetics solutions, power management, safety, operations and management, maintenance, decommissioning and disposal.
	Integration of solar thermal in buildings and nZEB/Passive-house concepts, combination with other solutions in hybrid products and the use of enablers of sector coupling including improvements at component level.

	Integration/use of biomass and bio-derived energy vectors (e.g. even the generation of biomass within the building skin).
	Integration of new methods for the energy exchange with the electrical grid, including in-building energy generation, storage and active-buildings concept.
	Solutions for optimization and integration/use of local thermal resources like geothermal resources or excess/waste industrial heat in buildings.
	Active facades: solar thermal, BIPV, hybrid PV, PV-thermal, switchable windows, switchable thermal insulation and their system integration.
	Seamless integration of renewable energy technologies in the urban environment, building integrated PV, several types of storage solutions, CHP technologies on fossil-free gaseous fuels (H or synthetic gases, thermochemical solar fuels, electrochemical solar fuels) for historic integration districts or hard-to-retrofit buildings in the energy systems.
	Create climate-neutral buildings or building environment blocks that generate integrated electric and thermal energy systems, with increased use of local renewables, as well as generate local support (citizens and professional stakeholders) to reach sustainability in the long term.
	Include not conventional low temperature sources (data centres).
	Decentralized storage tanks in buildings for thermal flexibility.
	Technologies for non-residential air-conditioning and ventilation.
	“Sector coupling“ by means of combined heat and power plants, fuel cell heating and powering, heat pumps, Power-to-X etc.
	Large building (malls, terminals, parking area, building services) energy production and storage systems integration for efficient energy production and uses.
	Grid-service and grid-forming capabilities of buildings for exploring the building flexibility. Integration of energy storage and charging point.
	Integration of electricity and heat storages; integration of mobility concepts.
	Building-to-Building energy and active buildings concepts. Aggregation of energy services and energy traceability.

Challenge 2 - Digitalization for planning, construction phase, commissioning and operation and also decommissioning and disposal. Methods of building performance assessment. (Measure carbon-neutral building stock).	
	Smart decision tools to evaluate the optimal technology choices and sizing in energy generation, storage and management.
	Digitalization of in-building energy management by considering internal energy production and storage as well energy traceability for building-to-building energy flows and active

	buildings by smart contracts (span across energy vectors, increase flexibility and reduce peak loads).
	Flexible energy planning tools and standardized packages for policy making regarding energy choices taking into account local factors, sector coupling, etc**.** Regulatory sandboxes for testing proof concepts for the next generation energy market.
	Flexible energy planning tools and standardized packages for policy making regarding energy choices taking into account local factors, sector coupling, etc.
	Development of solar cadastres to assess the generation potential of solar energy from the scale of single buildings to energy districts and metropolitan/regional areas. The cadastre might also be linked to a database of suitable technologies to be ranked according to the specifications of the installation site.
	Digitalisation in district heating and cooling networks: large scale collection data located throughout the DHC production, transport, distribution and user chain, machine learning for optimal control of the network and support the analytics intended to maximize use of RES and residual heat to reduce the operational costs.
	Built infrastructure as part of a local/regional decentralised energy system with consumer, prosumer and energy communities.
	Contribution to open platforms for sharing data and models (digital twins) in support of the energy transition for research-based knowledge. Standardization of the solutions.
	Building Information Modelling (BIM) from the cradle to the grave including life cycle analysis. Offer circular-oriented services at different levels of the Construction and Demolition Waste (CDW) supply/value chain. Against the background of rising ecological pressure and threatening scarcity of primary raw materials, demolition has a fundamental role to play in the circular economy (CE) and global decarbonisation of the Construction sector, as a source of valuable CDW-originated materials and components that can be effectively recycled or reused into new built structures.
	Open source, standardized open interfaces for easy data exchange; big data and open databases.
	Smart tools for Smart Homes + smart buildings with the aim that buildings become active elements in the power supply system (and maybe also in a heat network – if present).

All the proposals shall analyse the cross-cutting dimensions (cf. section 4.2 in the Joint Call text). Identify which are applicable and elaborate the inclusion of those in the proposal.

Cross-cutting dimensions	
	Integrated approach considering technical, societal, economy, architectural, urban planning and transport sector issues.
	Synergies with widespread of energy communities, neutral and positive energy districts and climate neutral cities policies.

	Needs of users have to be taken account for: issues of acceptance, participatory approaches to support the complex transformation processes, new ways of living and working, demography, urban-suburban relationships and sustainable mobility etc. Furthermore, the impact on rent pricing, affordable construction prices, comfort or also user data privacy have to be considered.
	Need of adaptation to meet urban planning regulations and specifically preserve cultural heritage landscape (e.g., building, complex of buildings).
	Increase the smartness of various building systems (energy management and control in broad view, heating, ventilation, electrical, information, …) and evaluate it through objective indexes (Smart Readiness Indicator).
	Indoor Environmental Quality (IEQ)— indoor air quality (temperature, humidity, CO2, radon), lighting, noise, ergonomics—and their effects on occupants' or residents' comfort must be taken into account. Strategies for addressing IEQ include those that protect human health, improve quality of life, and reduce stress and potential injuries.
	Contribute to co-create and reinforce local regional stakeholder innovation ecosystems.
	Contribute to SRL (System Readiness Level) TRL assessment framework.
	Contribution to networks of energy transition demonstration site and activities.
	Solutions have to consider different economies of scale and climate context.
	Standardisation of solutions, components and modules taking into account EU regulations.
	Knowledge diffusion (specifically for historical and special buildings where the EU market is crucial).
	Safety and security (cybersecurity, privacy, data protection, data rights) by design intended to generate trust in society and must be included in the proposals.

1.2 Objectives for the Joint Call module

The Call module is intended to establish the first portfolio of new solutions covering a fundamental part of the SRIA regarding innovation and demonstration in integration in the built environment. The projects will cover the challenges for massive integration of clean energy technologies in buildings identified in the SRIA. Proposals should demonstrate capabilities for integration of energy technologies and digitalization.

The Call module should provide integrated energy solutions covering the complexity of the energy system of high importance for the building sector. Pilot projects including demonstration and validation of implementable solutions should be part of the portfolio.

Multipliers (architects, building owners, civil engineers, craftsmen, engineering offices, manufacturers, municipalities, the public sector, etc.) should become part of the projects to lead new technologies towards commercial readiness.

A good set of approaches for cross-cutting dimensions inclusion shall be obtained from this call. The same applies to IPRs where suitable frameworks should be established in the projects.

In addition to the dissemination and experience sharing within the CETP Knowledge Community, the projects are invited to participate in the activities and events organised by other partnership programs like Built4People.

1.3 Expected impact

At scientific and technological level, the portfolio of projects will provide validated solutions ready to be included in new research and innovation processes intended to improvements and/or base for new developments. Valuable infrastructures in this environment should be visible and accessible to the RDI community.

At industrial stakeholders' level, participation of need-owners[1] from the energy, building and installer industry is expected. Their participation should provide requirements in the projects intended to reinforce local industry and drive developments to affordable solutions.

At societal level, participation of regional/local authorities representing need-owners will improve trust in society. It is critical to include policy makers in the built environment where regulations are crucial. Regional/local authorities can play a very important role in impact creation.

It is expected to yield improved access and higher use of research results, innovation, services and knowledge. Presented solutions should drive new technologies towards commercial readiness by reinforcing connection with multipliers (architects, civil engineers, craftsmen, engineering offices, manufacturers), creating high-quality new knowledge and skills in the complete built environment.

Proof methods of building energy performance assessment will support transition to carbon-neutral housing stock.

The prospect of standardized solutions, components and modules will benefit from larger markets and contribute to the efficient use of the funding. The increase of utilisation and sharing of research infrastructures is foreseen to mobilise innovation community.

Particular solutions shall contribute to the European target to renovate 25 Mio building units by 2030.

Collaboration among national programs support fast-track development of energy integration in buildings and guarantee economies of scale while also considering different climate context. The prospects of standardized solutions, components and modules will benefit from larger markets and contribute to the efficient use of member state funding. Furthermore, the diffusion of knowledge is the base of efficient responses in the integration of zero emission energy in existing, historical and special buildings as well as in mobility infrastructure (port, airport, railway station) where the possibility of a wide UE and international market is crucial.

1.4 Target groups

It is expected that project consortia including RDTI community (academia and RDI centres), laboratories and test facilities, industry in several fields and end-users (platforms or specific users) will submit proposals. Large projects (budget > 2M€ and/or more than 10 partners) should include the use of infrastructures for tests and contribution of regional/local authorities or installers in the proposal (as partners or with a specific role in outputs' deployments). Part of the industry and end-users will act as need-owners in the project participating as partners or committed to support deployments and validation. Multipliers, energy, building, equipment manufacturer and installer industry participate as partners. Need-owners can contribute providing requirements and as observers in test and formal validation processes.

1.5 Indicative targeted TRL

Projects applying to this Call module are expected to achieve TRL 5-9. In the same project, different technologies can reach different TRLs.

2. Project requirements

2.1 Additional project requirements

The projects shall include a perspective for technological transfer to the marketplace including:

- Validation and Qualification Plan
- Data management plan
- Business model plan.

At the pre-proposal stage, a clear mention of the corresponding planning should appear in the 3 sections, a) excellence, supporting project goals, b) impact, as part of the expected outcome and impact and c) Implementation, identifying deliverables in the work plan.

At the proposal stage, an outline of the plans and references to the content should be included. Specifically, the versions/deliverables over the project implementation shall be included in the Implementation section.

The Call Module aims to support projects with an expected requested grant (but not limited to) in the range of 1 to 5 MEUR

Annex A – Reporting and Knowledge Community Standard Work Package

Reporting and Knowledge Community Standard Work Package

Please insert the tasks below into your overall Work Plan as appropriate, and allocate the resources needed in the project budget (see budgeting estimation below). Tasks 1 and 2 are organised by the CETPartnership Knowledge Community Management in cooperation with the funded projects. Task 3 will be organised by the Joint Call 2022 funding partners with involvement of the CETPartnership Knowledge Community Management.

Knowledge Community events will take place virtually whenever feasible, in case of physical events, CETPartnership encourages you to consider, if feasible, to take the train and not to fly. If the latter is taken, try to compensate for the CO2-emissions of your flight.

Task 1. Involvement in formative evaluation

Subtask 1.1 – Reporting

- Take part in reporting on project activities, milestones and deliverables once a year on the CETPartnership digital collaboration platform. Information and support for reporting will be provided to selected projects.

Subtask 1.2 – Feedback uptake

Feedback will be given:

  - In writing: Feedback brief by the Knowledge Community management team,
  - In person by other funded Project Coordinators in the framework of peer-to-peer meetings where representatives from different projects meet in an organised virtual setting to discuss each other's project results and work.
- Project Coordinators and Partners are expected to consider the feedback for the remaining duration of their project's implementation.

Task 1 resource requirement estimation: 10 – 20 days/year/project.

Task 2. Knowledge Community activities in the working groups

Subtask 2.1 – Working Groups

- Prepare for, participate in, and ensure the follow-up of work in working groups: One thematic working group (organised by the TRI) and up to five cross-cutting working groups in virtual meetings. *(For each working group projects are expected to participate with at least one project representative in about one physical working group meeting per project duration period and two virtual working group meetings per year).*

Subtask 2.2 – Living documents

- Work with the knowledge management platform, mainly contributing to the development of living documents (related to the topics of the above-mentioned working groups that are in continuous development), spotlights and policy briefs. Consortium members will contribute own and other project results, e.g. clarify conclusions, give feedback, provide examples etc.

Subtask 2.3 – Cooperation on communication and dissemination activities

- Participate in online meetings and workshops to detect synergies between the projects, and support and improve (joint) communication and dissemination activities.
- Participate in a minimum of one joint project presentation activity organized by Knowledge Community.

Task 2 resource requirement estimation: 10 – 20 days/year/project.

Task 3. Deliverables to the joint call initiative

- **Subtask 3.1 – Annual reporting (in 2024, 2025 and 2026**
- **Subtask 3.2 – Final reporting (2026-2027 depending on project end date)**
- **Subtask 3.3 – Annual project event**
- **Subtask 3.4 – Final joint call event**
- **Subtask 3.5 – Abstract of the main results**

Task 3 resource requirement estimation: 15 days/year/project.

Budgeting of resources for the abovementioned tasks

The exact amount of resources to be committed depends on the project length, size, consortium composition and specific project focus. The final organisation and execution of the abovementioned tasks will be the result of an iterative process between the Knowledge Community Management and each funded project as applicable. The estimated resources required for Tasks 1, 2 and 3 roughly amount to:

i. 35 – 55 days/year/project.
ii. €7 000 – €10 000 per project for travel, accommodation and related expenses.

The advised minimum total resource allocation is €35 000 regardless of project duration.

Annex B – National/regional requirements (this information is tentative, please see Section 3.2. for confirmed contributions)

Annex C – Funding Partners' participation per call module (this information is tentative, please see section 3.2. for confirmed contributions)

Organisation	Acronym	Country/ region	Funding	TRI1 PowerPlanningTools	TRI1 RESDemo Powerflex	TRI2 Advancing RE technologies for power production through cost reduction	TRI2 Breakthrough R&D to increase RE power technologies efficiency	TRI3 CCU/CCS technologies	TRI3 Hydrogen and renewable fuels	TRI4 Heating & Cooling	TRI5 Integrated Regional Energy Systems	TRI6 Industrial energy systems	TRI7 R&I in clean energy integration in the built environment	TRI7 Solutions to energy transition in the built environment
Austrian Research Promotion Agency	FFG	Austria	5 900 000 €						2 000 000 €		1 800 000 €	2 100 000 €		
Fonds Innoveren en Ondernemen	FIO	Belgium/Flanders	1 000 000 €	x	x	x	x	x	x	x	x	x	x	x
Service public de Wallonie	SPW	Belgium/Wallonia	900 000 €	x	x	x	x	x	x	x	x	x	x	x
Emissions Reduction Alberta	ERA	Canada/Alberta	3 470 000 €					2 080 000 €	1 390 000 €					
Research and Innovation Foundation	RIF	Cyprus	3 000 000 €	x	x	x	x	x	x	x	x	x	x	x
Technology Agency of the Czech Republic	TA CR	Czech Republic	2 450 000 €	x	x			x	x		x		x	x
Energy Technology Development and Demonstration Programme	EUDP	Denmark	1 340 000 €		x			x	x		x	x		
Innovation Fund Denmark	IFD	Denmark	1 000 000 €			x	x			x			x	x
Ministry of Economic Affairs and Communications	MKM	Estonia	300 000 €	x	x	x	x	x	x	x	x	x	x	x
Estonian Research Council	ETAG	Estonia	150 000 €	x	x	x	x	x	x	x	x	x	x	x
Innovaatiorahoituskeskus Business Finland	BF	Finland	5 000 000 €	x	x	x	x	x	x	x	x	x	x	x
Agence Nationale de la Recherche	ANR	France	3 000 000 €	x			x	x	x	x			x	
Agence de la transition écologique	ADEME	France	1 500 000 €	x	x			x				x		
Pays de la Loire Region Council	RPL	France/Pays de la l	1 000 000 €			1 000 000 €								
Forschungszentrum Jülich GmbH (on behalf of BMWK)	FZJ/PtJ	Germany	18 000 000 €	x	x	x	x	x		x	x	x		x
Forschungszentrum Jülich GmbH (on behalf of MWIDE)	FZJ/PtJ	Germany	1 428 571 €	x	x	x	x	x	x			x		
Saxon State Ministry for Science, Culture and Tourism	SMWK	Germany/Saxony	3 000 000 €	x	x	x	x	x	x	x	x	x	x	x
General Secretariat for Research and Innovation	GSRI	Greece	500 000 €	x	x			x	x					
National Research, Development and Innovation Office	NKFIH	Hungary	1 160 000 €	x	x	x	x	x	x	x	x	x	x	x
The Icelandic Centre for Research	RANNIS	Iceland	1 000 000 €					x	x	x				
Department of the Environment, Climate & Communications/Geological Survey Ireland	GSI	Ireland	400 000 €							x				
Sustainable Energy Authority of Ireland	SEAI	Ireland	500 000 €	x	x	x	x	x	x	x	x	x	x	x
Ministry of National Infrastructure, Energy and Water Resources	MoE	Israel	600 000 €	x	x	x	x	x	x	x	x	x	x	x

Co-funded by the European Union

Organisation	Acronym	Country/ region	Funding	TRI1 PowerPlanningTools	TRI1 RESDemo Powerflex	TRI2 Advancing RE technologies for power production through cost reduction	TRI2 Breakthrough R&D to increase RE power technologies efficiency	TRI3 CCU/CCS technologies	TRI3 Hydrogen and renewable fuels	TRI4 Heating & Cooling	TRI5 Integrated Regional Energy Systems	TRI6 Industrial energy systems	TRI7 R&I in clean energy integration in the built environment	TRI7 Solutions to energy transition in the built environment
Ministry of Economic Development	MiSE	Italy	16 000 000 €		x	x		x		x	x	x		x
Ministero dell'Università e della Ricerca	MUR	Italy	4 200 000 €	x			x		x				x	
Latvian Council of Science	LZP	Latvia	400 000 €	x	x	x	x	x	x	x	x	x	x	x
Ministry of Energy of the Republic of Lithuania	ENMIN	Lithuania	1 400 000 €		1 000 000 €				400 000 €		(x)			
Malta Council for Science and Technology	MCST	Malta	500 000 €	x	x	x	x	x	x	x	x	x	x	x
Dutch Research Council	NWO	The Netherlands	2 000 000 €			x	x							
Netherlands Enterprise Agency	RVO	The Netherlands	8 000 000 €		x	x		x	x	x	x	x		x
The Research Council of Norway	RCN	Norway	12 000 000 €	x	x	x	x	6 000 000 €	3 000 000 €	x				
National Centre for Research and Development	NCBR	Poland	3 000 000 €	x	x	x	x				x	x		
Fundação para a Ciência e a Tecnologia	FCT	Portugal	500 000 €	x	x	x	x	x	x	x	x	x	x	x
Executive Agency for Higher Education, Research, Development and Innovation Funding	UEFISCDI	Romania	1 000 000 €					x	x	x	x			
Agencia Estatal de Investigación	AEI	Spain	2 000 000 €	x	x	x	x	x	x	x	x	x	x	x
The Centre for the Development of Industrial Technology	CDTI	Spain	1 500 000 €	x	x	x	x	x	x	x	x	x	x	x
Fundación para el fomento en Asturias de la Investigacion Cientifica Aplicada y la Tecnologia	FICYT	Spain/Asturias	300 000 €	x	x	x	x	x	x	x	x	x	x	x
Departemento de Desarrollo Económico, Sostenibilidad y Medio Ambiente. Eusko Jaurlaritza-Gobierno Vasco	EUSKADI	Spain/Basque	1 000 000 €			x	x					x		
Ente Vasco de la Energía	EVE	Spain/Basque	1 000 000 €			x	x							
Regional Development Agency of Cantabria	SODERCAN	Spain/Cantabria	150 000 €	x	x	x	x	x	x	x	x	x	x	x
Swedish Energy Agency	SWEA	Sweden	7 000 000 €	x	x	x	x	x	x	x	x	x	x	x
Federal Department of the Environment, Transport, Energy and Communications	DETEC-SFOE	Switzerland	10 000 000 €		x	x		x		x		x		
Swiss National Science Foundation	SNSF	Switzerland	550 000 €								x		x	(x)
The Scientific and Technological Research Council of Turkey	TUBITAK	Turkey	2 000 000 €	x	x	x	x	x	x	x	x	x	x	x
Scottish Enterprise	SE	UK/Scotland	7 105 377 €				x	x	x	x		x	x	x
Department of Energy	DoE	USA	5 000 000 €					4 000 000 €	1 000 000 €					
TOTAL			143 203 948 €											

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